REPORT OF THE COMMITTEE

on the

Organisation of Medical Research under the Government of India.

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CONSTITUTION OF THE COMMITTEE.

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Lieut.-Col. S. P. James, M.D., D.P.H., I.M.S. (Retired), Medical Officer and Adviser on Tropical Diseases, Ministry of Health, London, *Member.*

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सत्यमेव जयते

I.—INTRODUCTORY.

The Government of India (in Memorandum No. 1993-H., Government of India, Department of Education, Health and Lands (Health), dated 17 December 1927) appointed us members of a Committee to consider and advise upon proposals made by the late Professor E. H. Starling, C.M.G., F.R.S., Jodrell Professor of Physiology at University College, London, for the establishment of a Central Medical Research Institute for India, including the location of such an Institute, its structure and functions, its relationship with other organisations devoted to medical research and the constitution of and recruitment to the agency employed by the central Government for the conduct of such research.

The Committee were to investigate :—

(*a*) the framework of Professor Starling's scheme for the establishment of a Central Research Institute with special reference to recent developments in the field of medical investigation and research in India and elsewhere,

(*b*) the relations of the proposed Institute to research activities now in progress under the auspices of—

1. The Government of India,
2. The Indian Research Fund Association,
3. Agencies under the control of Provincial Governments (so far as consistent with the constitutional position established by the Reforms),

(*c*) the manner in and the extent to which the proposed Institute can co-ordinate the activities of the various agencies referred to in (*b*),

(*d*) the most convenient venue for establishing the Institute, regard being had to its projected activities,

(*e*) the strength and constitution of and method of recruitment to the Medical Research Department,

(*f*) the training of assistants for medical research work,

(*g*) the future of research on the problem of human and animal nutrition.

The Committee were also to make recommendations together with estimates of cost.

All the members of the Committee arrived in Calcutta in time to attend the 7th Congress of the Far Eastern Association of Tropical Medicine opening on December 5th, 1927, and had the advantage of acquainting themselves in this way at first hand with much of the recent medical research conducted in India, as well as of meeting workers from different parts of India and scientific delegates visiting India from other countries in the east.

Whilst at the Congress we availed ourselves of the opportunity to hold an informal meeting at which it was decided that before the assembling of all members at Delhi on 4 January 1928, Sir Walter Fletcher should visit the Kala Azar Commission now working in the field in Assam, and also the King Edward Memorial Pasteur Institute and Medical Research Institute, Shillong, and some of the civilian medical work in the tea-gardens and oil-fields in Assam and that Col. James should proceed to Kasauli with the object of preparing a note for the information of the Committee on the history and development of medical research organisation in India.

On 4 January all members of the Committee met again at Delhi and after a few days devoted to preliminary discussion of the subjects included under the terms of reference and the issue of some requests for information to Directors of Research Laboratories and others, proceeded on tour, visiting during the period 9—31 January the following places and Institutions :—

KASAULI.	Central Research Institute. Pasteur Institute of India.
DEHRA DUN.	Imperial Forest Research Institute. Forestry College (old Forest Research Institute), Chand Bagh. Imperial X-Ray Institute. Geodetic Survey Branch of the Survey of India.
DELHI.	
CALCUTTA.	School of Tropical Medicine and Carmichael Hospital. Laboratory of the Imperial Serologist and Chemical Examiner to the Government of India. Calcutta Medical College.
MADRAS.	King Institute of Preventive Medicine. Madras Medical College.
COONOOR.	Pasteur Institute of Southern India. The Deficiency Diseases Inquiry.
MYSORE.	Thomason Hospital.
BANGALORE.	Indian Institute of Science.
BOMBAY.	Haffkine Institute. Grant Medical College. G. S. Medical College.

At each of these Institutes detailed information about the sta the conduct of research and local requirements which had bee supplied were discussed with the Directors and others, as well the various opinions expressed upon the form that medical research organisation in India should take. In many cases written opinions very kindly prepared by Directors and others were supplied to the Committee.

We returned to Delhi on 1 February 1928, where the present report has been prepared.

The Committee are under heavy obligation for the opportunities of obtaining information which were everywhere freely provided for them.

II.—INTERPRETATION OF THE TERMS OF REFERENCE TO THE COMMITTEE.

By our terms of reference, taken together, it is plain that we are asked to consider by what manner and degree of centralised activity, if any, and by what forms of co-ordination and co-operation with other research activities, including those of the Provincial Governments, the Government of India may best discharge its responsibilities for the promotion of medical research.

In important respects our terms of reference differ essentially from those made to Professor Starling in 1920. The Government of India invited him to advise them only on the question of establishing a new Central Research Institute and it appears from his report that he confined himself strictly to that subject. That question is also specifically referred to us, but as one only of a set of connected problems. These problems are wide in scope and yet offer innumerable questions of intricate technical detail. They necessarily involve moreover a consideration of the precise form of constitutional machinery by which the functions of the central Government in relation to medical research are to be discharged under appropriate scientific direction.

We regard it as obvious also that we are invited to consider all these problems in relation to the needs of India as a whole. This would in any case be due to the subject-matter itself, for on general grounds it is self-evident that scientific research work as such, unlike administrative work, is not concerned with geographical or political boundaries and has indeed almost always to gain by ignoring them. It will no doubt be thought desirable, moreover, that we should discuss, and again from the nature of the subject-matter we could hardly avoid discussing, the relations between the medical research activities in India and those outside it, and especially in other parts of the Empire including Great Britain. In respect of these again we propose to deal with India as a whole, with India, that is to say, as represented in the important discussions and decisions upon research work at the Imperial Conference of 1926, to which we must refer again later in the proper place.

The problems referred to us are problems of the promotion and organisation of " Medical Research ". We would here briefly indicate the interpretation we think it right to give to these words.

In the first place researches in the medical field must never be limited, if new progress is to be made, only to the applied sciences of preventive and curative medicine. For no sound system of medical research can be established unless living organic connection is set up and maintained between applied work on the one hand, and work not of obvious and immediate utilitarian character on the other. Medical science as such, though having always its broad utilitarian objects in view, must be rooted in and draw freely from the basic sciences of physics, chemistry and biology as well as from sciences of such direct importance to tropical medicine as entomology, helminthology, protozoology and bacteriology.

Adequate provision indeed in a medical research programme for work which might be considered at first sight as having only an academic and non-utilitarian character is actually necessary to the successful study of specific problems of disease. At every step in the investigation of a disease, recourse must be had to knowledge of some highly technical kind belonging to one of the sciences contributory to medicine. More than this, recourse must be had to men not only having this specialised knowledge but also able to produce and apply it for the particular purposes in view. Progress in any research service worthy of the name will depend upon its possessing the services of men who are not only masters in their special technical subjects but able to maintain their mastery by continuous advance in them. It is as much our duty to recommend proper provision for work of this kind as to recommend the more obvious and direct studies of disease which must fail in effect without it.

In the second place we would point to the importance of interpreting " Medical Research " as including much more than the study of actual disease. We regard it as including all the processes of advancing knowledge by the use of which the human body may be brought to the fullest development of health and efficiency of which it is capable under given conditions of environment and by which no less it may be protected from disease and other injuries, or aided in its repair. It has been almost inevitable that in India, as indeed in other countries and climates, the prosecution of medical research in its historical development should have been directed too exclusively to the immediate problems of curative medicine and of the control of specific infective diseases. Research work has been organised sporadically in the past to meet desperate emergencies of epidemics, like those of plague, of malaria, of influenza, of kala-azar; and many notable practical triumphs have been won in India and through India for the world. The urgent and obvious problems of acute and epidemic disease have still to be faced and solved. But insistent as these are, they are not more urgent in reality than the less dramatic medical problems of daily life in India. In the light of modern discoveries we know, for instance, not only that recognisable and named diseases may come to vast numbers of a population from diet which is faulty in quality, even if adequate in quantity, but also that less defined but no less tragic evils may come in the form of diminished health and energy, and lowered resistance to infective disease. It is not likely that any other country in the world has more to gain than India herself from studies of human nutrition or more to give to other countries, as the work progresses, in new knowledge of the greatest scientific and practical value. In similar ways India has urgent need for better studies of the physiological laws or human labour and their application in industrial and agricultural practice, of the right management of daily life and work at high temperatures, and of some special physiological problems affecting women and child life.

While giving to medical research its fullest meaning in the sense just indicated, and while interpreting our terms of reference to include the whole question of the future of medical research in India, we do not forget that we are charged with some specific problems, among which the structure, functions and location of an Imperial Medical Research Institute takes first place.

The strength and constitution of the Medical Research Department and other agencies employed by the Government of India for the conduct of research at the Central Institute and elsewhere in India comes next in importance among the specific questions upon which we are asked to report. It is intimately bound up with the nature and scope of work assigned to the Central Institute, the requirements of investigations in the field, the supply of suitable Directors and other workers to Provincial Institutes, and the activities organised and financed by the Indian Research Fund Association. An integral part of this subject is the method of recruitment to the permanent staff of the Government of India's Medical Research Department and of temporary workers for emergency and other special investigations, as well as the training of assistants for medical research work.

We have been at some pains to decide how best to present in our report our views on these two main subjects, namely, the Central Research Institute and the workers actually engaged in research in the Institute and elsewhere in India. On these questions we feel that a knowledge of the manner in which the existing Central and provincial laboratories and the existing staff for research work, has gradually grown up from small beginnings, is essential to an appreciation of the present position and to an acceptance of the recommendations which we propose to make. Therefore we have decided to begin our report with a brief historical statement of the evolution of existing arrangements for medical research in India.

Having cleared the ground in this way we propose to consider specifically in separate chapters the questions which are stated in detail in the list of contents facing the title page of this report.

In a concluding section we shall endeavour to summarize our recommendations on the above questions.

" The future of research on the problem of human and animal nutrition " is a specified item in our terms of reference with which we shall endeavour to deal in a separate chapter of our report.

III.—THE EVOLUTION OF ORGANISED MEDICAL RESEARCH IN INDIA.

Earlier history of medical research organisation in India.

For our own guidance we have reviewed the modern history of medical research in India, which may be said to begin soon after the middle of the 19th century. We must not give any full account of that history here but we think that a brief sketch of the march of events and of the milestones marking its chief stages is almost necessary to an understanding of the present situation. The Government of India already have a Medical Research Department, a Central Research Institute and a Medical Research Fund Association, as well as important interests in the various Provincial Institutes for research. How have all these arisen? How are they now related? What is the need for better development and co-ordination that has led, as we may presume, to the appointment of our Committee? Any recommendation we can make must take account of the present organisations and of their history and should be guided and enforced by the lessons of past experience.

It is easy to understand how the problems of medical research first came within the ambit of the Government of India.

The great epidemic diseases of India and the great famines of India offered analogous problems. Just as the occurrence of great famines made it obvious as long ago as 1866 that steps must be taken to create an expert organisation for investigating and improving agriculture, so it became equally obvious that a parallel organisation should be created for investigating and dealing with India's great epidemic diseases. Small-pox, cholera and malaria were at that time the three chief scourges of the country. Small-pox could be controlled because a prophylactic was already available and had only to be applied. But the scientific world knew nothing of the causes or prevention of cholera or malaria, and therefore knew nothing of their prevention. The modern science of bacteriology was then in its earliest infancy. It is all the more notable therefore that at this early period of medical effort, the Government of India should have seen fit, in the year 1869, to appoint Dr. Timothy Lewis and Dr. Cunningham as special assistants to the then Sanitary Commissioner with the Government of India, for the express purpose of making scientific investigations for the benefit of public health. Both these officers made discoveries which are recognised as being classical and of world-wide interest to-day. Unfortunately neither officer found the clue to the cholera or malaria problem, though their work on these diseases, and their discoveries in other subjects, did much to stimulate specialised research and convince the Government of its utility.

The malaria parasite was not discovered until 1881, nor the cholera *vibrio* until 1883. Both discoveries made in Europe were quickly confirmed in India. As to cholera, the Government of India equipped a small laboratory in Calcutta in order that Dr. Cunningham might work continuously on the subject. This was the first bacteriological laboratory for research established in India.

In 1884 the Government of India began the publication of the well-known series of " Scientific Memoirs by Medical Officers of the Army in India".

The next milestone is that of 1889 when the Government began the practice of deputing selected medical officers to field inquiries aimed at finding the causation and means of prevention of diseases which for one reason or another were attracting serious attention. The first deputation of this kind was that of Surgeon Giles to investigate *Kala-Azar* and the so-called *Beri-beri* of coolies on the tea gardens of Assam.

For several reasons 1892 is another notable year, for it was then that Mr. E. H. Hankin came to India as Chemical Examiner and Bacteriologist to the North-West Provinces and founded his Bacteriological laboratory in Agra. He had studied at the Pasteur Institute in Paris and with Dr. Robert Koch in Berlin and his earlier reports, which were brilliant and suggestive, did much to stimulate interest outside the medical profession in bacteriological research in India. The year is also noteworthy for the acceptance in principle by the Secretary of State for India of a proposal by the Government of India to found a Pasteur Institute in this country. The driving force behind this proposal was of course the urgent need for protection against rabies (hydrophobia) in a country like India which is a great permanent reservoir of that infection. In April 1893 the Government of India were relieved of this enterprise as the result of a meeting of private citizens in Lahore at which it was resolved to collect funds by public subscription to found this Institute. The existing Pasteur Institute of India at Kasauli, which is a non-Government Institute maintained by voluntary contributions, was the outcome of this public-spirited effort.

In January 1895, the President of the Indian Medical Congress, held at Calcutta in December 1894, forwarded to the Government of India three resolutions passed by the Congress. Two of them recommended the establishment and endowment of a research institute. Consideration of those resolutions by the Government of India led to a proposal to relieve Mr. Hankin of his duties as Chemical Examiner, and to establish at Agra, under his direction, a bacteriological laboratory for the whole of India. The opinion of the local Governments, which were invited, suggested difficulties in the way of providing for the bacteriological requirements of the whole of India at one centre, and this, as well as the question of cost, and other obstacles, caused the scheme to be abandoned.

In 1896 plague appeared in Bombay and spread widely before it was definitely diagnosed by bacteriological methods. It took the country entirely by surprise. Locally there was nobody with the necessary technical knowledge, and Mr. Haffkine, who was the only officer employed by the Government of India exclusively as a bacteriologist, was performing anti-cholera inoculations in Bengal. He was sent to Bombay to confirm or refute the diagnosis of plague bacteriologically, and if the diagnosis was correct, to endeavour to devise a prophylactic or cure. He began work in a room in the Grant Medical College, his staff consisting of one Indian clerk and three peons lent by the Municipality. It was in this room that he elaborated his plague prophylactic vaccine, and it is officially reported that, in addition to carrying out the necessary preliminary laboratory experiments, he performed every operation in the manufacture of the prophylactic with his own hands. He inoculated himself with the prophylactic on the 10th January 1897. Soon afterwards various medical men and others were inoculated publicly and a demand for the prophylactic was created.

Event followed swiftly upon event while plague was spreading like fire eastwards and northwards throughout the country. The Government of India quickly engaged additional bacteriologists and other helpers from Europe and the first Indian Plague Commission, of which Dr. Almroth Wright was a member, was formed. Individual scientists who had theories to test were also attracted to India by the terrible drama that was being played. None of these early enquiries resulted in the discovery of the mode of spread of the disease, but the great part played by the young science of bacteriology in prompt diagnosis and in giving the means of prevention, became evident to everyone, and an insistent demand arose for the provision of laboratories and a staff of bacteriological experts to meet those utilitarian needs. Consideration of the plan proposed in 1895 for a central bacteriological laboratory for the whole of India was reopened, in conjunction with a scheme sketched by Dr. Almroth Wright in a letter to the Secretary to the Government of India in the Home Department and recommended in the report of the first Indian Plague Commission of which Dr. Wright was a member.

While the problems of plague were thus brought vividly to public and official attention, another chapter of history was being quietly opened. Surgeon-Major Ronald Ross was endeavouring at Secunderabad in the Deccan to prove by practical experiment and the dissection of mosquitoes the correctness of Manson's mosquito-malaria hypothesis. On the 22nd of August 1897 he made the discovery which put beyond all reasonable doubt the fact that mosquitoes carry malaria, and early in the next year (1898) the Government of India placed him on special duty to complete his self-appointed task. His discovery inspired and stimulated other members of the Indian Medical Service to engage in research work, and assisted to confirm the Government of India in their intention to establish an effective organisation of bacteriological workers and laboratories.

But progress in elaborating the Government Scheme was again delayed by an abortive project of the Rana of Dholepore to found a "Prince's Health Institute" in commemoration of the sixtieth year of Her Majesty Queen Victoria's reign; and it was not until early in 1899 that the Sanitary Commissioner with the Government of India (the late Surgeon-General Harvey) submitted definite proposals on the subject to the Government. His scheme provided for a Central Research Laboratory which was to be situated in a hill station, and for a local laboratory in each Province and military command. Each local laboratory was to be in charge of a whole-time bacteriologist to supply the medical officers of the Province or Command with expert assistance. The scheme was approved by all local Governments and was accepted generally by the Secretary of State. Circumstances, however, again intervened to delay its execution. These arose in connexion with the choice of a locality for the Central Research Laboratory and the selection of a Director for it. Research work of a high order was being done at the Plague Research Laboratory (now Haffkine Laboratory, Bombay). Liston was endeavouring to establish the transmission of plague by the rat-flea and Maynard had invented the decanting apparatus for vaccines which is now everywhere in use. In 1905 the British Plague Investigation Commission under Dr. C. J. Martin arrived in India and selected this laboratory as their headquarters. The special outhouses which had been prepared for experiments, as well as all the other resources of the laboratory, were handed over to the Commission, of which Liston became a member. As is well known, the work of this Commission settled the question of rat-flea transmission and gave to India and the world in general fundamental knowledge of the epidemiology of plague to which later years have added little. The brilliant success of the Commission's inquiry was in no small measure due to the help thus given at the Bombay Laboratory and for this and other reasons there was a strong move in favour of making it the Central Research Institute proposed in Surgeon-General Harvey's Scheme. On the other hand a serious accident in connection with the great Punjab anti-plague inoculation scheme had occurred in 1902 and Mr. Haffkine, the Director of the laboratory, broke down in health and left for England early in 1904. Major Semple, R.A.M.C. (retired), was Director of the Pasteur Institute at Kasauli and was regarded as well fitted to be Director of the proposed Central Institute. He was strongly in favour of establishing this at Kasauli and since he was to be Director of it, his view prevailed. The Central Institute was opened there in 1906, not far from the Pasteur Institute.

With some modifications and additions suggested by later experience the general scheme for laboratories thus introduced is essentially the scheme which exists to-day. The Institutes and laboratories which have been founded as development proceeded being (in chronological order of their opening) the following :—

BOMBAY .	The Haffkine Institute, Parel, Bombay .	1896-99
ALL INDIA	The Pasteur Institute of India, Kasauli .	1900
MADRAS .	The King Institute of Preventive Medicine, Guindy	1903-04
ALL-INDIA	The Central Research Institute, Kasauli .	1906
MADRAS .	The Pasteur Institute of Southern India, Coonoor	1907
BURMA .	The Pasteur Institute of Burma, Rangoon.	1915
ASSAM .	The Pasteur and Medical Research Institute, Shillong	1917
BENGAL .	The School of Tropical Medicine, Calcutta	1922

The Bacteriological (now Medical Research) Department.

We have now to follow the process by which scientific workers were definitely organised in a special cadre as the "Bacteriological Department of the Government of India" which is now known as the " Medical Research Department ". This organisation took its beginning independently of, and indeed preceded, the founding of laboratories and Institutes which we have just described. From early times it was the practice to recruit into the Indian Medical Service a sprinkling of young men with specialised training in one or other of the basic sciences, for instance in botany, zoology or physiology, to fill various technical appointments or the professorial posts which were being established in the Government Medical Colleges. In those early days the Indian Medical Service and the Royal Engineers were the only two organised scientific corps in India. For these and other reasons there were always in the service a number of medical officers who, being dissatisfied with existing knowledge and realising the vast field of discovery which was open to them, occupied all their leisure in research work. The Government of India wisely encouraged these activities and from time to time, as we have already noted, relieved certain selected officers of their routine duties by deputing them to study particular medical and public health problems in the field. These men usually had no assistants and travelled about the country on horseback or in country carts taking with them little apparatus except a microscope and some improvised laboratory equipment. The deputation of Surgeon Giles to study *kala-azar* in 1889-90, of Mr. Haffkine to study cholera in 1895, and of Surgeon-Major Ross to study malaria in 1898, are examples. Even some years later Stephens, Christophers, and James, working on malaria in India from 1901 to 1903, had no laboratory and no assistant, although by that time the creation of a regular cadre of officers for bacteriological work and of laboratories was an agreed measure. It was not until 1904 that a revised and enlarged scheme definitely providing for a 'Bacteriological Department' to staff the Central and Provincial laboratories came into being. This was approved by the Secretary of State on the 8th June 1905.

Under this scheme 13 medical officers who were already being employed either at one of the new laboratories, or in field research work under the Government of India, were appointed to a cadre, under terms laid down by the Secretary of State, for permanent employment in medical research and allied duties. The Central Research Institute at Kasauli was made the central laboratory in the scheme and was staffed with a Director and 3 Assistant Directors appointed from this bacteriological cadre and paid for by the central Government.

The 9 posts on the bacteriological cadre not attached to the Central Laboratory were utilised to staff the Provincial laboratories and were distributed as follows : Haffkine Institute 3, King Institute 2, Pasteur Institute, Coonoor, 2, Pasteur Institute, Kasauli, 2. The selection for these posts was made by the central Government in consultation with the provincial Governments, the salaries being met by the provincial Governments concerned. In 1915 two further posts were added to allow for the staffing of the Directorships of the new Pasteur Institutes at Rangoon and Shillong respectively, thus bringing the total cadre of the department and the total number of the posts filled to 15.

It must be remembered that the rapid development of medical science and especially of bacteriology and immunology during the past generation gave little time for the Government administrations, whether central or provincial, to realise the growing difference between original research work on one hand and the management of vaccine and serum manufacture and its connected activities on the other. Indeed in its early stages the development of the practical results of research in that kind of manufacture itself involved original research work.

Before 1914 it was already becoming obvious that the progress of medical research in India was being hampered in two ways, notwithstanding the development of the new laboratories and of the new Bacteriological Department. First, men were becoming fixed by appointment to definite laboratories instead of being mobile for field investigation. Second, the men put in charge of laboratories were becoming increasingly charged with many administrative duties and routine work in manufacture at the expense of their true research work.

The difficulty of finding men free to pursue field investigations wherever those might lead soon became acute. Neither Directors nor Assistant Directors, tied to their laboratories and burdened with routine duties, were available for special investigations. In 1914 two men were made mobile for this purpose by filling the Assistant Directorships at the Pasteur Institutes, Coonoor and

Kasauli, with men of the Assistant Surgeon Class.* In the same year the Government of India increased the cadre of the Bacteriological Department by 8 posts reserved for I.M.S. officers and 7 non-I.M.S. appointments thus making a total of 15 additional appointments. These 15 additional posts carrying no specific appointment were termed " non-specified ". Men holding them were usually the more junior men on the roster. They drew bacteriological pay on the same scale as Assistant Directors of Laboratories. Latterly when more senior men came to be employed in this way (as in field work) provision was sometimes made to give them emoluments similar to those of Directorships. It was still, however, the practical effect that a superior status belonged to the Directorships of the permanent laboratory Institutes. It was not suggested (until, as we shall see, it was proposed to make a new organisation for malaria studies) that a " specified " appointment should be one devoted to the study of a named science or group of problems and that it should rank as equivalent to a Directorship or at least an Assistant Directorship of a particular laboratory. The unpremeditated emphasis laid on appointments to fixed laboratories as the posts to which men should naturally look for advancement, both in pay or status, had important results not foreseen at the time. It had a notable influence in detaching men from those lines of work in which they would have gone on to become highly expert and so to reach their fullest usefulness to the Department in the advancement of knowledge. We point to this because in the proposals we have to make later we shall attach importance to giving to men holding specified posts as Directors in sections dealing with subjects of All-India significance equivalence in pay, status and the amenities of life to those holding Directorships in fixed laboratories. It is of vital importance to the progress of research under the central Government that appointment to the fixed Provincial laboratories should not (as at present) be too preponderatingly the natural aim of every man within the ' research ' cadre. It should be quite possible to preserve a due balance between Directorships of sections and Directorships of Institutes, if the terms offered leave it open to men to choose what their tastes, or qualifications, best fit them to do.

The addition of 15 posts to the bacteriological cadre, made with the object of conducting more inquiries in the field, had no opportunity of taking effect before the war began. During the war most of the research workers in India were drafted from the country and many of them gave invaluable services as technical or research officers in the various Expeditionary Forces. Active service conditions, which ended so far as Great Britain was concerned in 1918 or soon after, continued to 1920 or even later in India, and even after this the requirements of long leave and shortage of officers long prevented return to the pre-war state. There was thus a period of abeyance of some six years in the research activities of India, and with renewed work new conditions made themselves felt.

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*These two posts were afterwards utilised to cover the Special Duty Officer at the Haffkine Institute and the supernumerary post of Assistant Director at the Pasteur Institute, Rangoon.

The Central Research Institute at Kasauli and the genesis of Professor Starling's Scheme of 1920 for an All-India Central Research Institute.

We have seen that the only laboratory devoted to medical research directly supported by the Government of India has been the Central Research Institute, Kasauli, which normally has 1 Director and 3 Assistant Directors. The Institute has been conspicuous as a centre for field work and researches of All-India importance. But though extra workers are attached to, or for field enquiries are based on, this laboratory, the inadequacy of the staff combined with the unsuitability of the building accommodation had become even before 1920 so evident in view of the work, done or attempted here that after the war period the urgency of some improvement in these respects led to proposals for a much larger Central Laboratory and increased staff. In 1920 Professor Starling was invited to visit India to advise upon these and he then made the recommendations for a new Central or Imperial Medical Research Institute at Delhi which constitute the scheme referred to us for consideration.

The Indian Research Fund Association and recent Activities.

The condition since the war has been one of greatly increased activity and improved organisation, while at the same time in some important respects it has been one of grave difficulty. This difficulty has been the result of under-manning of the Research Department, due partly to inadequacy of the number of appointments in the permanent cadre and partly to difficulty in obtaining suitable men even for the appointments available, as a result of the growing failure of recruitment to the Indian Medical Service.

Institutes which formerly had as Assistant Directors officers of long training and approved capacity for research work now have some of these posts filled by less experienced men on whom Directors cannot rely for help and assistance as they did formerly. While the activities and commitments of these Institutes have enormously increased by reason of the greatly increased demands upon them by the Public Health and other interests for new investigations, for routine examinations and analyses and for the manufacture of sera and vaccines, as well for some kinds of technical training, there has been since 1914 almost no increase of superior staff. More recently the situation has been made still more grave by the shortage of men even for santcioned bacteriological appointments caused by the non-release of officers from the military side of the service, formerly the most important source of recruitment. The general result of these changes has been that the Directors and Assistant Directors of Laboratories have their energies entirely absorbed by routine duties which cannot be neglected, instead of being able to devote themselves at least in part to research.

The serious results of this decline have been mitigated, and medical research in India has recently been in large degree maintained, by the work of the Indian Research Fund Association. This was founded as early as 1911 with Government financial support, in the hope that contributions would come to it from private sources, a hope that has not yet had any important fulfilment. It receives from Government an annual grant of Rs. 5,00,000 which with interest on invested capital and provision for salaries of certain officers (those members of the cadre of the Bacteriological Department whose salary was formerly met from the Director General's Budget) provides a total gross annual income for fluid expenditure upon research of approximately Rs. 9,00,000 (about £63,000).

The Association was just beginning effective work when the war came. It is in the past few years only that its full influence has made itself felt. Besides financing investigations conducted by men in its direct employment the Association gives grants-in-aid to outside Institutions or workers. Its expenditure upon various medical research problems has amounted during recent years to about 9 lakhs per annum. The Association supports the newly formed malaria organisation for India until such time as it may be taken over directly by Government, and it partly maintains the Kala Azar Commission which has been working during recent years in Assam and other parts of India. It also finances the studies in nutrition at Coonoor as well as other researches of a widely varied character throughout India. It publishes the Indian Journal of Medical Research, and the Indian Medical Research Memoirs associated with it. It maintains its own library and stores. It encourages medical research in all possible ways, official and non-official, and assists workers when necessary in the publication of scientific papers or books and in other ways.

It is to the Research Fund Association more than to any other influence that must be given the credit for the much increased volume and scope of recent medical research activity in India, and for this we offer it the highest tribute. But it can now be recognised that in its promotion of research work the Association took the path, a natural one perhaps in all the circumstances, of relying too much upon the services of men already established in the Medical Research Department. As a result the fresh impulse given by the Association to research work itself actually intensified the strain upon the permanent and official Government organisation for research, which was already being severely felt. The Association designated to particular researches officers holding some of the 15 "unspecified" appointments in the official Research Department; the Government as employer of these officers continued to pay their salaries but counted the cost of this as a contribution to be added to the moneys already allocated to the Association as such. No nett gain in that respect came, therefore, to the research system of India as a whole. The Research Department, already overtaxed as we have seen, was still more severely strained by this loss of men in its direct service. Besides this the Association for the conduct of its own machinery used the services of men like the Public Health Commissioner and the Director of the Central Research Laboratory who were already overburdened and whose staffs were already insufficient for their own duties. To this strain thrown on the Research Department was added a degree of dislocation also, because for some inquiries (like that for instance of the Kala Azar Commission) men had necessarily to be provided whose services were needed as Directors or Assistant Directors of the Central or Provincial Laboratories.

It has been made evident we think that the Government Research Department and the Research Fund Association have alike reached a position in which no fresh enterprises of the kinds now urgently demanded can be undertaken without some new production of skilled workers. Lack of men indeed for one reason or another is the outstanding difficulty. To organise a new inquiry rapidly, into cholera for instance, would be impossible under existing arrangements without complete dislocation of some other no less urgent work. Experience has shown that recruitment at short notice from the open market for work under the special conditions of India is difficult and often impossible, as we shall point out in a later section in which we deal with the problems of recruitment as such.

IV.—PROFESSOR STARLING'S SCHEME OF 1920 FOR AN ALL-INDIA INSTITUTE FOR MEDICAL RESEARCH.

In 1920 the Government of India invited the late Professor E. H. Starling, C.M.G., F.R.S., Jodrell Professor of Physiology at University College, London, to visit India and advise them on the question of establishing this Institute. Professor Starling accepted the invitation and, after touring extensively in India with Major E. D. W. Greig, I.M.S., he adopted proposals, which had been put forward earlier in general form, and drew up a detailed scheme for the establishment of a Central Medical Research Institute at Delhi. The Government of India accepted the scheme subject to certain reservations as to cost and the stages in which it was to be completed, and the Secretary of State for India gave his general approval. On the 23rd September 1922 the Indian Legislative Assembly adopted a resolution approving the proposal to establish a Central Research Institute. Towards the end of the same year, as a result of the recommendations made by the Indian Retrenchment Committee, prosecution of the scheme was postponed and it has remained dormant through the subsequent period of indecision.

In the scheme before us Professor Starling proposed the erection and equipment of an All-India Medical Research Institute, to include a research Hospital, upon a new site at Delhi. The Institute appears to have been thought of as the centre absorbing all the financial resources of the Central Government available for medical research. The existing Institutes in the Provinces were not contemplated as belonging to any co-ordinated scheme bringing them into association with the Central Institute.

At Delhi it was proposed that there should be laboratories of bacteriology, medical biology, chemistry and pharmacology, and medical statistics, a library so complete that it would serve as a reference library for all the workers in India, a centre for the distribution of laboratory stores to other parts of the country and a hospital of 120 beds well provided with laboratories for the investigation of the cases of disease. At Kasauli would be the Vaccine and Serum Institute. The present building at Kasauli was considered insufficient for its needs. It should be rebuilt on the same site so as to double its present accommodation. Of the space thus afforded, two-thirds might be regarded as devoted to the vaccine factory while one-third would be laboratories in connection therewith, in which investigations could be carried out by the staff of the Kasauli Institute or in which workers from Delhi might continue their researches during the hot months of the year.

The Institute at Delhi and Kasauli were both to be regarded as parts of the Imperial Institute of Medical Research under one Director-in-Chief, who would have his seat at Delhi.

As much business would be involved in the keeping of the accounts of the two Institutes, in ordering material and in looking after the sales of vaccines and sera, it was advised that this routine administration should not fall on the Director-in-Chief, it was considered important that there should be a Secretary to the Institute, who should be responsible under the Director for the business management of the Institutes at Delhi and Kasauli.

The Imperial Institute of Research at Delhi was to include the following sections :—

Section I.—Bacteriology—

Director.
1 Assistant.

Section II.—Medical Biology including Entomology, Protozoology and Helminthology—

Director.
1 Personal Assistant.
3 Assistants or Assistant Directors.

Section III.—Biochemistry—

Director.

1 Assistant.

In addition to these Sections provision was to be made for the future establishment of a Section of (IV) *Pharmacology* with a Director and an Assistant and a Section of (V) *Medical Statistics* also with a Director and possibly an Assistant. It was not proposed that these should be instituted at once, but, in building the Institute, accommodation for these Departments was to be provided.

The *Library* was to be of a very extensive character. The Librarian should have a knowledge of foreign languages and would require one chief Assistant as well as a number of subordinates. The Section dealing with *Laboratory Stores* was to have a Storekeeper, who might be of the Assistant Surgeon class or Quartermaster-Sergeant.

The Director-in-Chief of the Institute was to receive Rs. 3,000 a month, the business Secretary about Rs. 1,000 and the Directors of Sections not less than Rs. 2,000. The Assistants might be of two grades, the first at Rs. 750, the second at Rs. 450. All the superior staff were to be provided with house accommodation at the rent of the house or at a rent equal to 10 per cent. of their income, whichever was the smaller.

The scheme also provided for an *Institute of Clinical Research* including a hospital of 120 beds with chemical, bacteriological and pathological laboratories and with an Outpatients Department having small laboratories for the immediate investigation of cases. This would also be at Delhi and more or less closely associated with the Imperial Research Institute. It was to be under a Director with 3 Assistant Directors namely, clinical, chemical and bacteriological and pathological; with each of these Assistant Directors an Assistant was to be associated. The Director of this unit was to receive Rs. 3,000 a month and the Assistant Directors each Rs. 1,500, and the Assistants Rs. 450 to Rs. 750. For the routine administration of the hospital a Medical Superintendent was provided at a salary of Rs. 1,000 per month.

It was recommended that there should be attached to the Imperial Institute 20 Research Scholars (not less than 12 to be appointed each year, of which not less than 6 should be placed in the clinical unit to serve as house physicians). These were to receive Rs. 150 a month and free quarters.

The suggestion having already been made (*cf.*, Report of Conference of Medical Experts held at Simla on 23rd and 24th May 1919) that a Central Health Board or Imperial Board of Health be constituted [comprising as *ex-officio* members the Director General, Indian Medical Service (Chairman), the Director of Medical Services, the Sanitary Commissioner with the Government (who should be a Director of Public Health), a Director of Research and a Director of Medical Education and such other co-opted members as might seem advisable] it was considered that this would be suitable as the natural Governing Body of the Imperial Research Institute. If so the Director-in-Chief of the Institute should be a member of it.

There was also to be a Scientific Board consisting of all the Directors and Assistant Directors, of which the Director-in-Chief would be the Chairman. This was to be entitled to discuss any subject related to the scientific conduct of the Institute, and to the appointment of Research Scholars and Assistants.

The cost of salaries for the whole scheme was estimated at Rs. 3,39,600 per annum and that of upkeep, including wages of menial attendants, etc., at Rs. 1,50,000, so that the annual recurring cost of the whole Institute (excluding the non-scientific expenses of the hospital) was to be 4½ to 5 lakhs. The cost of the Institute buildings was estimated at 22 lakhs, of which the immediate requirements would be 10 or 11 lakhs. The cost of the hospital would be 7 lakhs and that of the outpatient department 1 to 1½ lakhs. It was not claimed that these estimates were more than approximate.

The scheme therefore anticipated an initial outlay of about 20 lakhs with a further 12 lakhs later for buildings and an annual recurring expenditure of about 5 lakhs.

Consideration of Professor Starling's scheme.

During the years which have passed since the framing of this scheme important developments have occurred. In particular there has been a great development and expansion of medical research activities in India under the Indian Research Fund Association and increased participation by this means of the Provinces in central medical research activities. Increased and improved facilities for research work have become available or are being planned at some of the Provincial centres. Rapid developments have been witnessed in many of the basic sciences contributing to medical progress which have brought both new ideas and methods. New experience also has been gained in Great Britain and in other countries, as in India itself, of the promotion and co-ordination of medical research and its position among the functions of a Central Government. For all these reasons we cannot but think that Professor Starling himself would have been the first to recognise the need for modifications of the scheme if the opportunity of making them had come to him in his life time.

We ourselves now have the advantage of reviewing the scheme from the standpoint of present conditions and needs nearly eight years later than the date on which the scheme was framed. It is not surprising, therefore, that considerable modifications of the scheme appear to us necessary.

In some respects as will be seen the proposals we shall have to make approximate to some parts of Professor Starling's scheme but in others it is difficult for us to avoid departing considerably from many of his proposals. We think that it will be convenient and lead to clearer issues if instead of proceeding by way of proposing modifications in the scheme before us we give now our chief objections to the scheme as it stands and subsequently submit our own recommendations as a considered whole.

Our chief reasons for not recommending the adoption of Professor Starling's actual proposals are the following :—

(1) In our view it is of essential importance that any central organisation for research should be so constructed as—

(*a*) to provide for conducting research work in any or all parts of India, having regard to inquiries made out in the field no less than to those investigations more suitably made in fixed laboratories, and

(*b*) to allow, and so far as possible ensure, close co-operation with provincial and other centres of research.

In Professor Starling's scheme there is little to indicate that consideration has been given to these broad principles; his terms of reference were perhaps held to exclude it.

The scheme does not provide an All-India organisation in which all relevant activities may be brought into harmonious emulation and co-operation. It appears only to claim the position and privilege of an "All-India" status for a single institute and for a selected enclave of research workers.

If indeed the proposed Institute is to be adequate as an All-India organisation, then it is plainly planned upon an insufficient scale in some respects. No provision is made for adequate investigation, upon All-India lines, of such major Indian problems as those of Malaria, Cholera, Plague and so on. Only one Director and one Assistant is allowed for dealing with the many important bacteriological and allied subjects which would require to be covered by the activities of such an institute if it is to be thought of as self-sufficing without co-ordinated work outside it.

(2) The proposed Governing Body of the Institute, if as suggested this be an Imperial Health Board, would be very heavily burdened with other important functions than those of research. Further such a body has not been permanently constituted.

(3) The scheme proposes a heavy expenditure upon new buildings and equipment at a time when money is urgently needed for the due supply of research workers and the expenses of their work. Money unduly spent on new building must in the long run mean less available for the employment of suitable men.

(4) A special research hospital, demanding expensive buildings and equipment with special nursing and other services, is included in the scheme and no consideration appears to have been given to the possibility of meeting the needs for clinical research more suitably and completely in one or more of the larger cities of India. We shall deal more fully with this question when we make our own recommendations below, only noting here that we think that the claim that Delhi would supply adequate clinical material to be quite untenable.

(5) Delhi is selected as the site of the Institute but no argument is advanced in support of the choice save the desirability of close relation with the Imperial Government. The possibility of achieving this close relation by other and more effective means than geographical propinquity does not seem to have been considered. No reference is made to climatic conditions except that the climate of Delhi is admitted to be "trying" for a third of the year during which removal of the work to Kasauli is proposed, without apparent regard to the grave dislocation this would involve and its impossibility for many kinds of work without extravagant duplication of costly apparatus. Professor Starling considered that Kasauli does not provide the stimulus to be derived from intellectual intercourse between scientific workers of different kinds, but he nowhere indicates how this deficiency can be made good at Delhi.

V.—OUR PROPOSALS FOR A CENTRAL MEDICAL RESEARCH DEPARTMENT WITH A CENTRAL MEDICAL RESEARCH INSTITUTE AT DEHRA DUN.

A.—The Department.

Functions.—Among the terms of reference to our Committee, consideration of "The structure and functions of the proposed Central Institute" takes first place. In order that we may be in a position to define the exact functions of the Institute, and to state precisely the lines of work which we believe should be pursued in it, we have felt it necessary to approach this subject in a somewhat indirect way.

We have seen that the organisation in India as a whole has chiefly worked through the simultaneous existence of (*a*) a permanently constituted "framework" (The Bacteriological Department cadre together with the Central and Provincial Laboratories) and (*b*) an elastically administered organisation (The Indian Research Fund Association) supplementing and making use of this framework.

We have also seen that what is needed in India now, appears to be not so much a new policy with regard to arrangements for medical research, as a considerable forward movement in the evolution of arrangements which have gradually come into being in response to actual needs

In the combination of (*a*) and (*b*) wisely blended we have in our opinion the basis of organisation that will most facilitate the conduct of medical research on the best lines throughout India.

We need not at present discuss the constitution and method of working of the Indian Research Fund Association, with the relation of which to the Central permanent machinery we shall deal in a later section. We are concerned now with (*a*) the permanently constituted framework, or in other words with that part of the organisation which at the present time is entirely confined to the ordinary Government machinery for medical research. This machinery consists of the Institutes, Central and Provincial respectively, under their Directors. Beyond this there exists only the administrative controlling agencies of the Governments, Central and Provincial respectively, which at the present time are most directly brought to bear through the Director-General, Indian Medical Service and the Public Health Commissioner with the Government of India in the case of the Central Research Institute, Kasauli, and the different Surgeons-General or Inspectors-General and Directors of Public Health in the case of the Provincial Laboratories.

We have carefully studied the organisation of medical research work as this applies to India as a whole and on this we have obtained the opinions of many of those engaged in medical research or concerned with medical research administration in India.

We are satisfied that the Provincial Institutes must continue to work as at present largely on their own lines to supply local needs and to develop their spheres of usefulness under their own Provincial Governments. No useful purpose would be served by suggesting any form of direct control of these Provincial Institutes by any central agency. Nevertheless we believe that an efficient central medical research organisation might assist these Institutes in many ways. We shall refer to this again in a later chapter.

In regard to what may be called the higher aspects of scientific medical research and All-India problems of every kind there must be, if progress is to be made, a Central Medical Research Organisation specially adapted in its constitution to deal with such problems. Provincial Institutes cannot normally be expected to cope with All-India problems, nor is it likely in the near future that they can ever maintain a sufficient staff of research workers to make provision for work of a purely scientific and technical kind on a scale adequate to the needs of India. Further if each Province were to undertake medical research work in all subjects on anything like a complete scale it would clearly be a very costly procedure for India as a whole.

It is obvious that the establishment of the Institutes, created, as we have seen largely to meet immediate utilitarian needs, particularly for routine diagnostic work, antirabic treatment, the preparation of prophylactic and curative sera and vaccines, and for post-graduate instruction, was essential. But it has to be admitted that in Institutes which are mainly devoted to routine work, to teaching, or to the preparation of vaccines and sera the lines followed by original research tend to be incidental and haphazard. It must also be admitted that the very necessity of providing Institutes of this kind has had the effect of tending to obscure the need for systematic and continuous research on broad lines outside immediate laboratory preoccupations, into problems more especially relating to disease as it affects the life and prosperity of the great rural populations of India. It is for this reason partly that the outstanding malaria, plague and cholera problems in India have never received, and indeed we might say could never have received owing to the conditions and constitutions of these laboratories, the attention such problems require.

There has, however, developed to a certain extent an ideal and tradition of All-India Service in the laboratory of the Central Government at Kasauli and efforts to shape research policy and create machinery for continuous and deliberate investigation of the more important aspects of All-India medical research have always engaged the attention of Directors of this Institute.

This organisation, as a result of experience, has from the beginning taken the form of centralized units or bureaus whose business it has been to conduct, direct and stimulate work along some particular line. It was in work connected with one such section (that of Medical Entomology) that the late Major Cragg, I.M.S., met his death from typhus when investigating this disease and relapsing fever in the field. From this section has come much of the dissemination of recent systematic work regarding the Indian plague fleas such as for example the recognition that one species, *cheopis*, was really three, thus raising important issues on which there has since been much work done.

To illustrate further our point and using the only examples available we may say that from another section has come about directly or indirectly a great deal of the recent knowledge of malaria in India. This section has conducted or been directly concerned with malaria surveys all over India. It has formed standard collections, a sectional library and arrangements for systematic distribution of its bulletins, etc., on malaria. As a result of its activities the study of species and systematic work generally on *Anopheles* in India have been brought to a state of perfection seen in very few places elsewhere in the world and this is the only place in India where an authoritative identification of any mosquito, anopheline or culicine can be obtained. There has thus been made available to workers in India itself on the spot, facilities which is a large part of the

Empire, can only be got from the distant British Museum, and this has greatly helped work in India on malaria, filariasis, dengue and other subjects, including public health activity against mosquitoes. It is due to this section that there exists in India, and scarcely anywhere else, advanced classes of instruction in malaria including malaria research in the field.

This special unit for malaria research, now the new Malaria Survey of India, began as the Central Malaria Bureau and its history will enable us to see very clearly the need for proper organisation and policy in respect to medical research in India viewed as a whole. Like much else in Indian medical research arrangements the Central Malaria Bureau came into being originally in response to an actual urgent need for its services. In 1908 there occurred a terrifying epidemic of malaria which caused in the Punjab alone during November and December some 307,000 deaths as compared with an average monthly mortality of 50,000. Enquiry showed that at least seven or eight similar epidemics had occurred previously in the same area. It is significant of the need for a proper Central machinery that at this time, when several large laboratories were already at work throughout India, it was largely by accident that as a result of a previous special investigation under the Government of India (inquiry into Malaria and Blackwater fever in the Duars) there happened to be two officers qualified to investigate such conditions as now arose almost simultaneously in the great districts of the North-West and in the city of Bombay, where also the increased prevalence of malaria had caused much alarm.

In this case the lesson was learnt. Shortly after these events the Government of India made arrangements for establishing a research organisation " which should enquire systematically and continuously into the scientific and practical problems of malaria in India.". Out of the arrangement thus initiated arose the Central Malaria Bureau which survived the war and has since gradually built up in India an organisation and system of malaria research which is universally admitted to be in essential respects complete and efficient.

This gives us confidence then that there is a field for an All-India medical research organisation and it is clearly desirable that such a central organisation should have somewhere a home and headquarters, just as the Survey of India and some other All-India Departments have their headquarters. In this aspect, *i.e.*, as a headquarters for a central medical research organisation working throughout India we view the idea of the building of a Central Medical Research Institute with approval.

A Central Institute merely as another large laboratory in India would probably be a mistake. On the other hand as a "brain" to co-ordinate All-India issues in medical research, a centre for research in the field throughout India, a source of help to all in regard to highly expert opinion, a bureau for publication and information, a location for standard collections and a central medical library and a storehouse for accumulating the results of All-India work generally the proposition of an Institute has a complete justification.

In this we feel that we are in entire agreement with the general opinion of Directors of Institutes and others throughout India. The only difference between our own views and that of some others is to be found in the different estimates of the size and importance of buildings which would be required at the headquarters of such an All-India organisation as we have indicated to enable it to carry out its work freely and to the greatest advantage. In this respect we give later our reasoned opinion and estimate of what sort of accommodation would actually be required. It is clear that when all is considered a quite effective building or group of buildings would be required of a kind justifying the title of an Institute and we therefore see no reason why it should not be termed the Central Medical Research Institute for India.

Before considering its location and nature of the Institute as a building we must first decide the kind of organisation of which it is to be the headquarters. Having decided on the size and structure of the organisation and its method of working the consideration of the building will not offer so many difficulties.

To our knowledge it has frequently happened that a large Institute has been built which has absorbed nearly the whole of the funds available thus making the question of workers a secondary consideration and the provision of any supplementary buildings that might be required in the future impossible. We hope we have made it clear by our method of approaching the question of a new Institute that we do not wish our recommendations to lead to any such mistake.

सत्यमेव जयते

Structure.—Returning to the organisation of workers, on the existence of which alone we think the creation of an Institute of the kind meditated could be justified, and considering the All-India character of this organisation we are satisfied that the structure best suited to it would be in the main that of "Sections under Directors".

"Sections" of the type we have in mind have shown their value as a result of experience in All-India work at the existing Central

Research Institute, Kasauli, and they have been adopted in his scheme by Professor Starling. Since Professor Starling's time a very complete unit of this type has come into existence under the name of the Central Malaria Organisation for dealing with all aspects of malaria research in India and this unit, definitely constructed to meet certain functions, may be taken to a large extent as a model for future units of the same general character. By "Section" we mean an organised unit so constituted that it can take charge of, develop and make its own, a particular branch of medical research for which, so to speak, it is given a mandate. We may distinguish "Sections" which deal with a particular science such as bacteriology, biochemistry, etc., and "Special Units" which are organised for the study of a particular disease or subject in all its aspects. Occasionally the work of a "Special Unit" inevitably becomes permanent and of wide scope with specialisation along particular lines of research. In this event the officers who direct the work of the Unit will always be highly expert and it may be taken for granted that they will have been in the Department a number of years. In order to secure to them the pay and status fitting to their qualifications and seniority it is necessary to raise the Unit to the level of a separate "Section". This has happened with regard to the malaria special unit which we now recommend should be made one of the separate sections of the new Central Organisation and Institute under a title "Malaria Survey of India".

A section, *e.g.*, a section of Bacteriology, should have a Director in charge. This Director will ordinarily be, or very soon will come to be, the recognised chief authority on this subject in India. He should have the same pay, emoluments and status as a Director of a Provincial Laboratory. This is essential to prevent constant changes in the Directorship and loss of men just as they are becoming most useful as experts and masters of their subject. The alternative will inevitably lead to the Directorship being held merely *en passant* by inexperienced men. Sections dealing as they do with important subdivisions of medical research will be the chief agency that Government will possess for prosecuting such research on the best lines and also the chief means by which Government can secure authoritative advice when necessary in a particular branch of knowledge in medical science. Sections, therefore, when constituted are important and very valuable organisations and require to be kept at a high level of expert efficiency. This can only be done by having the best men possible as Directors. The emoluments of a Director of a Major Provincial Laboratory at present include (*a*) an allowance of Rs. 200 as Director and (*b*) free quarters. These should be equally admissible in the case of Directorships of Sections. If held by non-service men the pay should be on a corresponding scale, probably Rs. 2,500 per mensem will be necessary to obtain the services of the kind of non-service men required.

It is very liable to happen in India, where the effect of leave and retirement have to be considered more than at home, that work of high value and importance which has been developed by some particular man is abruptly brought to a close and perhaps not resumed for years, when all may have to be learnt over again.

Continuity of work with continuity in trained staff and laboratory methods is essential to the proper working of a "Section" and to ensure this continuity there should ordinarily be an understudy (Assistant Director) or understudies who will take over in due course from the Director. An Assistant Director should receive some allowance, *e.g.*, on the scale of Rs. 100 per mensem. If held by non-service men a salary of Rs. 1,500 to 2,000 will probably be required to get the kind of man required.

It will add greatly to the working efficiency of research organisation if newly joined men are placed in "Sections" according to their predilictions for a particular type of work. They will then acquire training and gain increasing experience in the section and in due course have the opportunity of becoming Assistant Directors or Director if their ability merits this. Through the existence of well organised sections subordinate staff also obtain training and take their place as valuable members of organised teams.

Sections work in the following way :—

> Through their permanent posts they form an organised nucleus for the continuous conduct of some important branches of medical research. Through their Directors each fosters its own line of work throughout India, watches over the interests of this type of work, and sees that proposals for its extension when necessary are suitably put up. Sections form their own standard collections, sectional collections of reprints, etc., develop their own technique and their own field arrangements. They also form their own liaisons with workers in other parts of India and their Directors should have power under the general direction of the Director-in-Chief to detail men to promising conditions for work in chosen localities in various parts of India or, with necessary prearrangement, to the most suitable institutions. They equip their own expeditions, and datach workers for inquiries as the occasion demands.
>
> Through their Directors the sections put up proposals to the Indian Research Fund Association for additional work as required or considered desirable from time to time. Such proposals are normally approved by the Association. If a newly organised inquiry is initiated then it works in liaison or under direct control of the section. Special workers such as entomologists, or, biochemists may be temporarily attached to sections to work out special problems or for training. In this way sections can grow temporarily, provisionally or permanently in exact accordance with the needs of actual research

> and when necessary special units can be created, *e.g.*, a Cholera Investigation Unit from a section of Bacteriology. In this way these sections would follow the natural line of scientific growth.

It is satisfactory that the Central Government now possesses an adequate research organisation for malaria, one of the major epidemic diseases of India. It is unfortunate that the same cannot be said as regards either cholera and plague. This is the more surprising because cholera and plague are the chief diseases which, internationally, give the climate of India its bad reputation, and they are the diseases against which foreign countries endeavour to protect themselves by rigorous quarantine regulations. They are not only "All-India subjects" but also "extra-India subjects". Europe, and indeed the world in general, has long looked to India to lead the way in research on cholera and plague, and the fact that the Central Government has no organised group of workers continuously occupied with research on these diseases creates an unfavourable impression in other countries and tends to make those countries impose maritime measures which hamper India's seaborne trade. It is everywhere felt that India has international as well as national obligations in respect of those diseases and that the defensive attitude which she is forced to adopt when either of them is the subject of International Agreements or Conventions, is unworthy of her brilliant history in some other lines of medical and public health research.

Unhappily the major epidemic diseases are by no means the only subjects which would legitimately claim the attention of the central Medical Research Organisation and Institute. Professor Starling says truly in his report that "no country is to be compared to India in the wealth of problems on which further knowledge is required" and he lays stress on the desirability of research into the ordinary non-infectious diseases which are not generally grouped together as tropical. Our attention has also been directed to the urgency of research into the leprosy problem in India. We understand that a fund amounting to nearly 20 lakhs of rupees has already been collected by public subscriptions for research work into that disease and for the instruction of provincial workers in a method of treating it. Others have urged the claims of what is called "Public Health Research" as for example, research into infant mortality in India which is rightly regarded as among the most pressing of India's public health problems. We are aware, also, that at the All-India Conference of Medical Research Workers held in 1925 requests for assistance from the Indian Research Fund towards no fewer than 12 separate subjects of medical research were made. Finally we must give serious attention to Professor Starling's scheme, for the provision of an "Institute of Clinical Medicine" including a hospital of 120 beds well provided with chemical, bacteriological and pathological laboratories for the investigation of the cases of disease admitted into it and an out-patient department also equipped with smaller laboratories for the immediate investigation of the cases presenting themselves for diagnosis and treatment.

Having, however, regard to the money and means which, even on a liberal estimate, may be available for the Government of India's present scheme, it seems clear that it will hardly be possible to create an organisation that can deal individually with all the many subjects that call urgently for systematic and intensive enquiry. It is evident that our task must be one of compromise. For example, the organisation for malaria research has grown slowly during a number of years and we understand that the whole arrangement as regards staff, buildings, equipment and recurring cost, is the least from which effective work can be expected. Having regard to this slowly won experience it is doubtful if effective work into either of the other major epidemic diseases of India could be expected from a smaller organisation or at less cost. If the same arrangements were to be made for cholera research and for plague research as have already been made for malaria research, it is probable that these three diseases between them would absorb a superior staff of some 15 research officers and would cost annually about five lakhs of rupees. Therefore it is evident that an organisation arranged on the plan of concentrating work exclusively on a particular disease or specified subject must be asked also to deal with allied diseases or subjects. For example a Section of Medical Biology should also deal with kala-azar, relapsing fever, sandfly fever, dengue, tick-typhus and other insect-borne diseases, also perhaps with amoebic dysentery, medical protozoology and medical entomology in general. In the same way as regards bacterial diseases, organisations created for the specific study of cholera and plague would have to divide between them other subjects in which bacteriology plays a chief part, as also the arrangements necessary for preparing vaccines and sera. Even with these modifications there would remain a number of All-India subjects requiring separate arrangements, particularly epidemiology and statistics (statistico-epidemiology), helminthology, so-called deficiency diseases and other physiological and pathological problems of food and nutrition, biochemistry (including pharmacology).

On the whole, therefore, it seems that we must be content to arrange for the nucleus of various general Departments rather than aim at organising units or sections for the specific study of particular diseases or problems. We hope, however, that, when these general departments are established, the importance of continuous research into the major epidemic diseases will not be lost to sight, but, that, as men and means become available separate units for their systematic study will be evolved from the general Departments in the same manner as has been done for malaria.

We now give the Sections and special units that we think should be constituted. These are :—

Sections—

I.—Epidemiology and Statistics.
II.—Bacteriology and Immunology.
III.—Biochemistry and Pharmacology.
IV.—Medical Biology.
V.—The Malaria Survey of India.

Special Units—

VI.—Clinical Research.
VII.—Nutrition.

I.—*Epidemiology and Statistics*—

1 Director.
1 Assistant Director.

No arrangement now exists in India for continuous study in modern medical statistical work and epidemiology. A section of " Medical Statistics " with a Director and possibly an assistant was recommended for future establishment by Professor Starling in his scheme for an All-India Institute. In 1920 the Secretary of State for India sanctioned the appointment of an Epidemiological Statistician but this post was never filled in consequence of retrenchment which followed closely on that year. There is special need for such work in India and the fact that there is no arrangement yet for this should be remedied. Some research of this kind, notably statistical studies of the prevalence of cholera, has been carried out under the Indian Research Fund Association but there is a wide field for extension not only in the lines of statistical method which is very freely required in medical research but in the application of the results of field work to the analysis and interpretation of Indian vital statistics, the study of general epidemiological problems, the study of problems of populations and of other questions of great importance. This work to be effective must be carried out continuously and systematically and this is best secured by its organisation in a special section. It is obvious that the activities of such a section should be "Central".

On the general principle of the constitution of Sections, *i.e.*, that they should have a Director and an Assistant Director to understudy and perhaps take his place in due course, we have suggested for the superior staff 1 Director and 1 Assistant Director. Professor Starling mentions only an " Assistant " but unless this assistant be practically what we mean by an Assistant Director he would not give the section that continuity of work and policy which is desirable. We think in view of the large field of inquiry and the demands likely to be made for statistical help by other units, that this staff allowed by us is the least that would serve the purpose. These posts should be filled by men who have been trained in mathematics and modern statistical methods and who have in addition experience of medical research methods. At least one computing clerk in addition to other subordinate staff would be required. An extra research worker will be necessary for enquiry in the field but such a post might be considered after the section has been at work for some time. We anticipate that workers in other fields of inquiry will come from time to time for periods of work in this section, to receive assistance in the statistical reduction of their data and in other ways. Thus we hope to see a close nexus set up between this section and many of the fields of inquiry outside.

II.—*Bacteriology and Immunology*—

1 Director.
1 Assistant Director.
1 Assistant Director (Sera and Vaccines).
1 Research Worker (general duty).
1 Research Worker (Immunology).
1 Research Worker (Bacteriophage or filterable viruses).

This is one of the sections provided for in Professor Starling's scheme, but in his report there is no discussion of the lines of work for which the section would be responsible, and the staff recommended was only one Director and one Assistant Director. Since 1920, when his report was written, new discoveries have opened out branches of study, particularly in immunology, filterable viruses, and the bacteriophage problem, which can only be pursued effectively by workers who are qualified in the necessary technique and who are able to devote their whole time to one or other of these highly specialised lines.

The need for research of an adequate kind upon cholera in India is one of great urgency as we have already shewn. A Cholera Commission or organised Inquiry more or less on the lines of the existing Kala-Azar Commission may become necessary for work at various problems of the transmission of cholera in India. The readiness with which this could be set up will depend very largely upon men available in this section. On the other hand several men might be engaged on 3 years' agreement by the Indian Research Fund Association for cholera work and men selected from these used to build up a section by suitable further engagement.

Already one well qualified worker, Dr. Goyle, is employed on plague investigations under the Director of Public Health, U. P. (Inquiry financed by the Indian Research Fund Association). In view of the enormous importance of plague to India some further provision for research in this subject seems desirable. Adequate investigation of bacillary dysentery is also important. The "types" of human and cattle tubercle in India are now occupying the whole time of an investigator working under the Research Fund. Extensive work is being carried out on leprosy.

There is also much important basic research work connected with bacteriology in its general aspects. A necessary activity of an organised bacteriological section will be the maintenance of a standard type collection of different organisms of importance in disease. Standard type organisms are now frequently required by workers in India and have to be obtained from the National Type Collection at home. It is very desirable that such a collection, so far as it relates to Indian requirements, should be created and maintained in India and the bacteriological section of the Central medical research organisation would be the natural agency for this work.

Immunological research work of a high order and of great practical utility has already been done at the Central Research Institute, Kasauli, and provision for continuing it permanently must be made.

Arrangements are even now in train for continuing Dr. d'Herelle's work on the bacteriophage problem which is yet in its infancy but promises already to revolutionise some aspects of curative and preventive medicine. As yet there is no arrangement for the study of filterable viruses in spite of its importance for India in relation to rabies, small-pox, and other diseases.

At the existing Central Research Institute anti-cholera and anti-typhoid vaccine and antivenin are now manufactured on a large scale. Though this is not strictly speaking research work it is closely related and for the present it probably would be best to continue this necessary manufacture as before in connection with the Bacteriological Section.

In the time at our disposal we have not been able to make that close study of the question of centralised manufacture of sera and vaccines which would enable us to do justice to so important and difficult a subject. We think that Government after coming to a decision on our present scheme, should later explore this subject further.

The minimum staff for which we think provision should be made for all these activities is that given above. It may be noted that one Assistant Director has been allowed wholly for manufacture. This work requires the whole time services of a man as is shown by experience at the existing Central Research Institute.

The Director and each Assistant Director will require an assistant who will ordinarily be of the "Assistant Surgeon" or "Sub-Assistant Surgeon" grade and who has been trained either at the Institute or elsewhere in bacteriological technique.

A subordinate staff on the lines of that at the Central Research Institute, Kasauli, but on a somewhat larger scale will also be required.

III.—*Biochemistry and Pharmacology*—

1 Director.

1 Assistant Director.

1 Assistant Director (Experimental Physiology)

2 Assistants.

This is a combination of Sections III and IV of Professor Starling's scheme. He recommended separate Directors for biochemistry and for pharmacology respectively, each having an Assistant. We recommend that they should be combined. The distribution of the staff as among the several parts of these subjects must depend upon the men available.

The Central Research Institute, Kasauli, at present possesses no staff nor laboratory arrangements for biochemical research. This branch of science has been developed greatly in recent years in medical research Institutes in Europe and the United States, and the need for its better development in India is widely recognised.

The Scientific Advisory Board of the Indian Research Fund Association have already shown their appreciation of the importance of biochemical research in this country by equipping and contributing during each of the last two years half the annual recurring charges of the Biochemical Section of the Haffkine Institute at Bombay. The amount thus contributed is more than half a lakh yearly. Contributions amounting in the aggregate to a large sum have also been allocated to biochemical inquiries in connection with malaria, kala-azar, diabetes and other diseases, and recently the Association has agreed to provide the salary and equipment of a biochemist for the "Deficiency Diseases" inquiry which is being conducted at Coonoor. Some permanent form of unit is, therefore clearly demanded. We think that for the present 1 Director, 1 Assistant Director, 1 Assistant Director (Pharmacology) and 2 Assistants with necessary subordinate staff should be allowed.

This Department will be the natural place for the maintenance of "standard" preparations, *e.g.*, pituitrin, insulin and the like.

IV.—*Medical Biology*—

1 Director (holding without pay one of the following Assistant Directorships).
1 Assistant Director (Medical Entomology).
1 Assistant Director (Protozoology).
1 Assistant Director (Helminthology).
3 Assistants.

A large part of the medical research work in India and other tropical countries is closely associated with medical zoology. This includes protozoology, medical entomology, helminthology and other subjects, but is also linked up with the rather special type of research work connected with insect-transmitted diseases. The special subjects named are studied both systematically as branches of zoology and in their relation to disease, as in investigations of hookworm or kala-azar transmission.

The laboratories and equipment are very similar for all these subjects, which are much interrelated. The work is highly specialised and requires experienced and highly trained men. This section in many ways has affinities with the type of work done in the special malaria unit but each is too important to be sacrificed to the other. They should, however, be in close touch and have their headquarters in neighbouring blocks if working at a Central Institute. The nucleus of such a Department has always existed at the present Central Research Institute, Kasauli. The functions of a medical biology section and the lines of work to be pursued are definite and have already been well tried in the field and in the laboratory.

Each of the officers should have an Assistant of the grade of Assistant Surgeon or Sub-Assistant Surgeon. For each of the three types of laboratories there should be a sufficient staff of laboratory attendants and collectors.

A Medical Biology section might be largely constituted from the personnel of the present Kala-Azar Commission when this becomes reabsorbed within the section.

V.—*The Malaria Survey of India.*—This is a section which has gradually been organised as follows :—

Staff—

1 Director.
1 Assistant Director.
1 Entomologist.
2 Field Research Officers.

Subordinate Staff—

1 Assistant Surgeon.
5 Sub-Assistant Surgeons.
1 Draughtsman and Photographer.
5 Laboratory Attendants.
5 Sweepers.
4 Chaprasis.
1 Insect Collector.
3 Clerks.

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We have mentioned the history of the origin of this organisation in the earlier paragraphs of this chapter. We strongly recommend that the organisation be placed on a permanent basis as part of the sanctioned medical research organisation of the Government of India.

A Malaria Engineer should be associated with this section. The necessity of including a Malaria Engineer in any adequate organisation for the study of malaria was strongly emphasized at the 7th Congress of the Far Eastern Association of Tropical Medicine held in December last at Calcutta and the line of work and place filled by such an Engineer in any scheme for the investigation of malaria problems is generally recognised. He would be of great help in keeping up liaison with actual public health work in the control of malaria and advising upon the engineering work of anti-malaria schemes.

VI.—*Clinical Research*—

1 Director.
2 Assistant Directors.

Professor Starling in his Scheme for an all-India Institute associated with this a large Hospital. We do not believe that Delhi would be a suitable place for clinical research as we do not think the supply of clinical material would be adequate for the purpose. We believe that facilities for work of this kind are eminently greater in the chief cities of India like Calcutta, Bombay and Madras where there are already large hospitals and clinics.

Apart altogether from inquiry into the major problems of the great epidemic diseases, a vast field of research in India is open to workers in clinical medicine. There is a widespread demand in India for the scientific investigation of disease problems by means of agencies similar to those which have been evolved in England and the United States under the title "Clinical Units". Professor Starling, in the report now under reference, developed the idea to its logical conclusion by recommending the establishment of an "Institute of Clinical Medicine" as an integral part of the central research organisation of the Government of India.

As regards Calcutta, accommodation for this kind of research is already provided at the School and Hospital of Tropical Medicine. At Madras the need for accommodation will be fully met when the sanctioned schemes for the extension of the Medical College are completed. At Bombay also we were impressed by the ample laboratory accommodation and facilities for clinical research available at the G. S. Medical College in association with the King Edward VII Memorial Hospital as well as by the facilities which will be available at the Grant Medical College when the new pathological and other Departments now under construction are opened.

Having regard to these and other activities which we had an opportunity of examining during our tour, we are disposed to agree fully with the opinion so often expressed to us during our visits that with regard particularly to clinical research "the greatest need is for men rather than for buildings".

Officers in charge of Medical Colleges and other Institutes in India have directed our attention to the claims of clinical research of the type contemplated in Professor Starling's scheme, and have deplored their inability to pursue it in their own Institutes on account of lack of staff.

In this connection it seems appropriate to remark that the Government of India has already, in an indirect way, namely through the agency of the Indian Research Fund Association, assisted to give effect to the essential idea underlying Professor Starling's hospital scheme. We refer to the deputation of two officers of the Medical Research Department to act as professors at the School of Tropical Medicine, Calcutta.

We think that in general this is the way in which the central research organisation of the Government of India can most advantageously and economically play its part in aiding clinical research. We appreciate the need for increased association of high class research work with medical education. From the point of view of medical education, and the provision of future research workers we regard the present inactivity in clinical research by the professorial staffs of Medical Colleges in India as unfortunate. The Clinical Unit we recommend should, we think, take the form of a Section of the central organisation much more closely associated with outside Institutions than an investigating unit or officer visiting some parts of India for research into a particular problem. The members of the Clinical Research Unit would in fact be intended to work each attached to a selected institution in one of the large cities where the best conditions exist for his work. The Unit should have at least three investigators employed and be made up of a Director and two or more Assistant Directors under the Central organisation.

A research worker deputed from the Central Institute for this duty will ordinarily take with him such subordinate staff as may be considered sufficient and he should in addition employ as helpers post-graduate research-scholars obtained locally, with a special view to discovering and assisting those who may have a special aptitude for research work. The attachment of workers of this kind to centres of medical education cannot fail we think to bring subsidiary advantages, especially by attracting to research work those young medical graduates inclined for it.

We think that no officer of the Central research organisation should be deputed for clinical research and professorial duties to a particular provincial college or other local Institution for a longer period than three years.

The staff of the clinical unit should have suitable accommodation provided for it at the Central Institute as their base. Here their problems may be taken for fuller investigation when necessary, with the collaboration of allied sections.

VII.—*Nutrition.*—"The future of research on the problem of human and animal nutrition" is a specific item in our terms of reference. We shall, therefore, deal with it in a separate chapter of this report. Here it is only necessary to say that we have allowed for this section—

1 Director.
1 Assistant Director.

Any less number of Sections than those indicated would be insufficient to deal even with the broadest subdivisions of medical research at the present time and any great reduction in the number of research workers of the first class in these sections as outlined would bring great risk of nullifying altogether their effectiveness, and would necessitate an entirely modified view of our proposals, on the other hand if these Sections can be developed on the lines we have pointed out and the assistance of the Indian Research Fund Association to supplement their work be assured, an entirely new impetus will have been given to medical research in India likely to lead to great advance in the future.

The sections must be built up very carefully and in their natural line of growth. We have not attempted therefore to lay down details of subordinate staff, working expenses and so on. The first step is the appointment of Sectional Directors and the building up must be done under them. If a suitable Sectional Director is not immediately available workers should be recruited for some line covered by the future proposed section. For instance a first class bacteriologist should be temporarily (3 years' agreement) employed on bacteriophage, viruses or other work and when the right man has appeared a Bacteriological Section can be definitely organised. When men are available at once a given section should be brought into being as soon as possible.

Cadre.—The Medical Research Department under the Government of India consists of a cadre of 32 appointments.* From this cadre is provided :—

(1) Superior Staff for the Central Research Institute, Kasauli (4).
(2) Superior Staff for the Provincial Institutes and the Pasteur Institute of India, Kasauli (11).
(3) Men for various purposes including special enquiries under the Indian Research Fund Association (17).

The 4 men detailed to the staff of the Central Research Institute at Kasauli are directly under the Government of India.

Out of the total cadre 11 are required for the staffing of Provincial Institutes. Once posted their services are, temporarily at least, lost to the Government of India ; but on the other hand they have not to be paid for during such period as men on the cadre hold these posts, since their salaries are now paid by the Provincial Governments concerned.

At present the 17 appointments under (3) are accounted for as follows :—

On leave	1
On deputation to the Calcutta School of Tropical Medicine	3
Employed under the Indian Research Fund Association ..	9
Appointments in abeyance or vacant	4

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* The cadre of 32 is not entirely homogeneous. Under the original resolution of Government (dealing with 30 appointments then sanctioned) 23 were reserved for I.M.S. and 7 were not so reserved. The 7 posts not reserved (non-I.M.S. Medical Research Department) have been filled by men recruited in India engaged under fixed terms of appointment. At present specified appointments are held by 11 I.M.S. and 4 non-I.M.S. and in the 17 unspecified appointments the proportion is at present 8 to 6, 3 being vacant.

Neglecting men on leave and vacant appointments the cadre of the Government of India for the Medical Research Department is therefore distributed at present as follows :—

Directly under Government of India..	4
Variously seconded	23

It is very desirable that the central agency should continue to provide a cadre for the purpose of staffing the Provincial Laboratories. It facilitates recruitment by having a larger department and wider connections, and tends to a better type of man being provided than would be the case if men were recruited singly by each Province as required. It also aids the co-ordination of medical research in India as a whole. It is the only method of meeting the recognised requirement of maintaining a war reserve of medical officers who are highly trained in bacteriology and allied subjects.

The Provincial Institutes in some cases, with their large spheres of activity, appear to us to be so undermanned that no really helpful assistance is given to the Directors. We hope that this may be realised by the Provincial Governments themselves and that more Assistant Directorships of the right type may be asked for and approved. If this should come about the requirements for the central cadre will be increased. This again, however, would not involve any further financial obligation on the part of the Central Government as these posts would be paid for by the Provinces.

The item of 9 men employed under the Indian Research Fund Association requires some explanation. A number of I. M. S. officers shown as employed on the Indian Research Fund Association are now paid for by Government of India, not as formerly through the budget of the Director General, Indian Medical Service, but in the form of a grant to the Association to cover their salaries.

Inquiries of this kind at present being conducted by men on the cadre are (*a*) Kala-Azar Commission (2), (*b*) Deficiency Diseases Inquiry (1), (*c*) Malaria Organisation (2), (*d*) Malaria Survey of Sind (1). It has further to be noted that men qualified to work on and especially to direct such important inquiries are not usually available outside the cadre in India or even on short notice outside India. Provision from the cadre in such cases is therefore more or less imposed as an obligation on Government. It may be expected that some activities of this kind, *e.g.*, the Malaria Organisation will be taken on to the regular central organisation and so lessen the number of men required for this purpose. Provision for important researches of this kind where suitable men are not available except on the cadre will probably also be made in the future from the enlarged staff of the Central Institute.

The number of men at present on leave is 1 only, but this cannot be taken as normal. It is usual under service conditions to allow a definite percentage for filling vacancies due to leave requirements. In a cadre committed to supplying 11 Provincial and 27 Central posts there should certainly be a reserve of 8 men for this purpose.

It must be admitted that in practice some posts may be filled by very junior men who, while suitable for carrying on research in sections or under the Research Fund Association, might not be suitable for particular vacancies occurring, thus some small latitude must be allowed in respect to numbers of cadre and ability to exactly utilise all their services. We have not, however, stressed this point and have neglected it in making our provisions for new cadre required.

Assuming that 11 men are required for staffing Provincial Laboratories, and that 8 may be estimated as being on leave and assuming also that the cadre is increased to provide 27 men* for the Central Organisation whose headquarters is the Institute the position of affairs would be—

Under Government of India	27
Variously seconded	11
On leave	8
Total	46

At first sight then 14 men over the present sanctioned budget appear necessary to put into action the scheme we have proposed. Actually we think a provision of at least 20 additional appointments on the cadre should be made including the specified appointments just described in the Sections and the additional 6 specified appointments for Provincial Institutes mentioned in Chapter VI.

We now see that the Central Medical Research Organisation which we have spoken of as necessary to the idea of an Imperial Research Institute is in its true perspective the active Government of India Medical Research Department. This Department of 52 would have 27 on its active list, 8 would on the average be on leave and 17 lent to the Provinces. With such a cadre it is possible to conceive of a proper system of recruitment and of a reasonable plan of working.

Our utilisation of all posts reserved for the Association shows, however, how seriously that Body would require to recruit outside the cadre if it were to continue to conduct its activities on anything like its former scale. For the present it will be clear that 20 is the minimum number of increased cadre which is compatible with the scheme for an Imperial Medical Research Institute on the basis we have outlined and for some extra assistance to Provincial Institutes. This also hypothecates that the Indian Research Fund Association will itself recruit.

It is through the Medical Research Department of the Government of India that most of the medical research work in India has been conducted and most of the existing provincial and central medical research organisation built up. We think, therefore, that this Department should continue to provide the permanent cadre of medical research workers to meet the requirements of India.

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*Including Director-in-Chief of the Institute and 2 Assistant Directors mentioned in the next section.

B.—THE INSTITUTE.

(1) *Structure.*—It is not logically necessary that every one of the Sections we have mentioned should be based on the same headquarters. But if the idea of collecting the Sections together to ensure inter-communication between workers and the common provision of library and other general facilities is abandoned a great deal tending towards success of the scheme as a whole will be lost. By bringing these various units into close associations we not only achieve co-ordination and mutual help between workers but at the same time create an atmosphere very favourable to general progress and good work. Unless there are strong reasons why any particular unit should not be based along with the other units the general policy would be to provide headquarters accommodation for all Sections and Units at the Institute.

Obviously there must be a Director of the Institute, and as Sections in our scheme are under Directors, the Director of the Institute will naturally be designated Director-in-Chief. Under him of course will be administrative arrangements for the Institute generally.

The Institute therefore will be organised as follows :—

(*a*) Director-in-Chief and administration with the necessary accommodation for Office, Library, Stores, Publication, etc.

(*b*) Section of Epidemiology and Statistics.
Section of Bacteriology.
Section of Biochemistry and Pharmacology.
Section of Medical Biology.
Section of Malaria Survey of India.
Special Unit of Clinical Research.
Special Unit of Nutrition.

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(*a*) Direction and Administration.

We give the superior staff needed under this and our reasons for recommending it.

Director-in-Chief.
Assistant Director (Administration).
Assistant Director (Publications).

Director-in-Chief.—Whether the Director-in-Chief should also be a Director of a Section requires consideration. He will no doubt be competent to direct the Section in which his interests more particularly lie or in which he may actually have previously been

Director. The combined duties, however, might be too heavy for one man to perform with justice to the Institute and the Section. On the other hand a Director divorced from any Section of his own might find it difficult to keep in satisfactory touch with his own line of work, and might find his position among his senior colleagues more satisfactory if he shared with them the responsibilities of a Section of his own. Since, however, the organisation of the Central Medical Research Institute will probably be built up under the administration of the first Director-in-Chief and since the relationship that subsequent Directors-in-Chief may bear to any existing Sections at the time of their appointment is not known and may vary with circumstances, we think that it may safely be left to the governing authority in consultation with the Director-in-Chief to decide in each case what Directorship of a Section, or Special Unit, if any, he should hold.

Assistant Director (Administration).—The Director will need help not only in the duties of supervision of menial staff, routine business transaction, etc., but in the general scientific running of the Institute. For this reason an assistant with knowledge of research conditions is essential. This post would correspond closely to that recommended by Professor Starling as a "Secretary to the Institute, who should be responsible, under the Director, for the management of the Institute at Delhi and Kasauli."

Assistant Director (Publications and Information).—The editorial work in connection with the Indian Journal of Medical Research and Indian Research Memoirs should be done as at present at the Central Institute and definite provision for this should be made. At present it is too heavy a task for the Director unaided and the work is steadily increasing. It is almost certain under the new scheme that additional publications will be necessary. This work will take up a large part of the time of the Assistant Director (Publications and Information).

Administration of the Institute will certainly involve some arrangement for help to workers in regard to literature as well as for distribution of reprints and other published matter throughout India and foreign countries. Attention has been drawn by the India Office to the desirability of bringing the results of work done in India to the notice of scientists and others abroad, and for this and allied work some definite organisation is needed.

It is understood that each specialised Section or Unit of the Central Research Institute (Bacteriological, Protozoology, etc.,) will make its own arrangements for keeping its workers informed in the literature and developments of the subject in other parts of India and in foreign countries. But there are activities outside the sphere of particular sections which it is desirable should be provided at a Central Institute. We consider that to meet these miscellaneous needs there should be established in connection with the Institute what would amount to a small unit for general medical intelligence and information with the following duties:—(1) To organise and have charge of a central library of books and current journals and arrange for translation and abstracts to be supplied when asked for by workers of central and provincial organisations. (2) To arrange for the distribution of scientific papers prepared by medical research workers in India. (3) To arrange for the reception and guidance of research workers and visitors from other parts of India and from foreign countries and to give them facilities for conducting specific enquiries. (4) To prepare at the Central Institute exhibits by which the results of research work and the efficacy of their application are demonstrated to the public. Our attention has been directed on several occasions to the absence of adequate arrangements for interesting influential visitors and the general public of the country in the results of the research work already accompilshed.

During our recent visits to Laboratories, Medical Colleges and other Institutes, workers have frequently brought to our notice that they find a difficulty in keeping abreast of the literature and development of their subject, and particularly that it is often difficult and sometimes impossible in India to obtain translations or abstracts of scientific articles in foreign languages. The Imperial College of Science at Bangalore was the only institute in India where we found any arrangement to meet that need.

The "General Medical Intelligence and Information Unit" described above is designated in part to meet these important needs, and we are assured that it would be a welcome and highly useful section of the Institute.

This "Unit" should be under the Director-in-Chief of the Institute, and should constitute his "intelligence staff" for information and publicity. But the actual working of the unit would be under the immediate charge of the Assistant Director (Publication).

The staff required would be :—

1 Librarian.

1 Assistant Librarian.

1 Translator.

1 Assistant to the Editor.

1 Draughtsman.

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The Librarian should be a properly trained man specially engaged for his suitability to the post. The Assistant Librarian should be a well educated young graduate on a pay graded up to that of the Librarian.

A Translator is a long felt need frequently mentioned by workers. No great difficulty would probably be found in getting a suitable man in India. Probably Rs. 700 might be provisionally allowed.

For assistance in Editorial work there at present exists a clerk's post on Rs. 150—5—200. For this purpose a man of more educational attainments than the ordinary clerk possesses is desirable. Men of the right sort are difficult to obtain and pay might be allowed on a somewhat higher scale. He should be designated Assistant for Editorial work.

A draughtsman is another long felt need. There is no difficulty here or in meeting other minor subordinate requirements. These will be best arranged when the general scheme has been sanctioned.

Subordinate clerks including typists will be necessary and probably at least one laboratory attendant.

The provision now suggested for administrative staff is the minimum.

The Sections.—The constitution of the sections has already been indicated. It may be estimated on the average that laboratory accommodation for at least six workers in each section including the nuclear staff of the section will be required and that more will be required for some, such as for example the manufacturing work of the Bacteriology Section.

(2) *Location.*—We naturally attach the utmost importance to this part of our task, for a wrong choice could not fail to have far reaching consequences on the future of medical research in India. We have studied available official documents relating to the selection of Kasauli as the site of the existing Central Research Institute and those dealing with the selection made by Professor Starling in 1920 of Delhi as the site of a new Institute. We were also careful to obtain during our tour views of Directors of existing institutes on the subject.

There are some general principles on which, in our view, the decision as to location should be based; they are concerned with the functions of the Institute in relation to medical research in India as a whole, and to the lines of medical research work which will be pursued in it.

On the first subject we have already stated our opinion that the Central Organisation and Institute should be constructed so as to provide for conducting research work in any or all parts of India having regard to inquiries in the field no less than to those investigations more suitably made in a fixed laboratory. We look upon the Institute as a centre for co-ordinating all-India issues in medical research, as the headquarters of field research throughout India, as a source of assistance to all in respect of highly expert opinion, as a bureau of information and publication, as giving library facilities, and as a storehouse where the results of All-India work will be collected and made readily available. This is the part that the Kasauli Institute so far as is possible with the means available, plays, for from the beginning of its history it has been organised in units or sections whose business it is to conduct, direct, and stimulate work along particular lines without regard to geographical or political boundaries and in closest possible liaison with similar work in the rest of India.

The application of these functions to the question of location is obviously that, provided that the Institute is reasonably accessible from different parts of India and is reasonably near to the winter and summer headquarters of the Central Government, no particular advantage would be gained by locating it in one place rather than in another.

On the second subject we defined broadly in chapter II what we mean by the term medical research and we shall state in chapter VII what we regard as the actual duties and responsibilities of the Government of India Central Organisation. We shall say definitely that they relate to two different classes or sides of medical research, the first being concerned with the solution of problems obviously of immediate utilitarian interest to physicians and to medical and sanitary administrators, the second being concerned with basic research along lines which, at first sight, do not appear to lead towards any immediate utilitarian goal. We spoke of medical research of the latter class in interpreting our terms of reference; we said it is as much our duty to recommend arrangements for work of this kind as it is to recommend provision for the more obvious and direct studies of the former class. For the reasons given in that chapter basic research will certainly be one of the most important activities of the highly expert staff employed at the Central Institute.

The bearing upon the choice of a locality for the institute is twofold. Firstly, we may readily admit that an institute mainly devoted to investigations immediately serviceable to physicians and sanitarians could have abundant material to work on if it were located in a large city or seaport. But it must be equally readily admitted that basic research can be pursued best away from those everyday problems which, if conscientiously dealt with, leave the worker little or no time for more advanced studies requiring whole-time attention and animal experimentation on a large scale. That this is true in India, as elsewhere, is shown by the fact that at the existing Kasauli Institute it was possible, with a very limited staff, to conduct, and bring to a successful issue, work on immunology that is everywhere recognised as being of essential present importance and future practical utility. Secondly, while it is certain that, whatever the climate may be, diseases are best studied in the places where they occur in nature, it is equally certain that basic research can best be done in a climate favourable to the energy and mental acuity of the workers and, moreover, in a climate where delicate technical processes and procedures in the laboratory as well as animal experiments, are not interfered with by extreme heat. We are aware that in an institute situated in a locality with a severe hot season some amelioration can be obtained by providing a "cool-room" as has been already done, for example, at the School of Tropical Medicine, Calcutta, but this plan is impracticable when more than a few workers must be accommodated.

For these reasons, and without any desire on our part to attempt to drive the argument too far, we may say that on the whole it would be preferable to locate the institute away from a large centre of population with its pressing everyday problems, and away, too, from a place where the climate during a great part of the year makes sustained thought and intensive effort difficult or impossible.

There is, lastly, a general rule on which Professor Starling laid great stress, namely that the institute should, if possible, be situated where frequent intellectual intercourse between workers of different sciences provides a "stimulus which keeps the brain active and maintains the restless spirit of inquiry at a high level."

We shall now consider, on the basis of these general rules or principles, the places which, from time to time have been suggested as suitable locations for the Government of India Central Medical Research Institute. They are in alphabetical order: Bangalore Bombay, Calcutta, Delhi, Dehra Dun, Kasauli, Madras, Nasik, Poona, Simla.

Bangalore.—We think that this locality must be ruled out as being too far from the Headquarters of the Central Government.

Bombay.—The claims advanced for selecting Bombay are chiefly that it contains a wealth of clinical material. two medical colleges, and the Haffkine Institute, some of the buildings of which could, perhaps, be utilised. It is strongly urged that medical research and medical education should go hand in hand. These and other reasons advanced relate almost exclusively to clinical research. We have recommended that this item of medical research should be arranged for by a "Section" of the research organisation based on the central headquarters but with the members of the section working in, and attached to, suitable hospitals, colleges or other institutions in the large cities. Apart altogether from the claims of basic research stated above in our remarks on general principles, we think it would be a mistake to locate a second institute in a city where an excellent Provincial institute (the Haffkine Institute) has already been established.

Calcutta.—What we have said about Bombay applies also to Calcutta. We have already mentioned that the Government of India, through the agency of the Research Fund Association, assists medical research in the Calcutta School of Tropical Medicine by supplying two members of its permanent Medical Research Department to act as professors.

Delhi.—We think that Delhi must be ruled out for climatic reasons. We are convinced that satisfactory research work on the lines which we have recommended for the new Central Institute would be impossible during at least five months of the year in this city.

Kasauli.—Except for the kind of medical research defined above as being concerned with the solution of problems obviously of immediate utilitarian interest to physicians and except that there are no workers in other sciences stationed there, Kasauli fulfils all the general rules and principles described. It is reasonably accessible, it is close to both the summer and winter seats of Government, and its climate is very good. Workers are free from the distractions and many of the expenses incidental to life in a big city. The absence of local medical research problems keeps their activities focussed on the All-India character of their work and automatically requires them to pursue research in the field in different parts of the country and particularly in rural areas where India's most important problems lie. Certainly Kasauli has the disadvantage, to which Professor Starling refers, of being isolated intellectually, but a much more serious disadvantage is that the site of the existing institute and available sites elsewhere are much too restricted for an institute like the new institute which we consider is now necessary for the Government of India's central organisation. If Government approves our scheme it will not be necessary to take up the question of endeavouring to ascertain in what way extension of the existing Kasauli institute might be arranged.

Madras.—Our remarks on Bombay and Calcutta are applicable to Madras. Great extensions have been made to the King Institute of Preventive Medicine and when the Medical College extensions are completed, the Presidency and the city will be well provided for.

Nasik and Poona.—We think that these must be ruled out as not being sufficiently central.

Simla.—If a hill station is selected, Simla is certainly inferior to Kasauli as a place for the central research institute.

Dehra Dun.—This has often been suggested as very suitable. Here are situated the headquarters of the Forest Department with the new Imperial Forest Research Institute and the Imperial Forestry College. It is also the headquarters of the Geodetic Branch of the Survey of India. The X-Ray Institute is here and it is the actual or projected site of the Royal Indian Military College, the Railway Institute, Telegraph headquarters and other activities. Dehra Dun is thus an important centre of scientific, technical and educational activities under the Government of India and likely to become even more so in future. In the Forest Department and with the Survey of India are scientific men engaged in lines of work often directly related to medical research, such for instance as chemistry and entomology, as well as skilled mathematicians and technicians in various branches.

Though Dehra Dun is not one of the large cities of India it is a place of some size and importance. It is close to Delhi with direct mail service connection, and it is possible to dine at Dehra Dun and be in Delhi by early morning or *vice versa*. Though no claim is made that facilities for clinical research at all approach those in the large cities they are not absent. There is a new hospital of 100 beds under consideration which could be enlarged further if required. There is a Leper Hospital for 80 beds with a small attached laboratory and there are military hospitals.

There is ample site accommodation. Indeed it seems clear that Dehra Dun has been chosen as an important centre because it offers a large area of land suitable for building sites combined with a climate superior to that in the actual plains of North West India.

For some four months in the year we are aware that the climate is somewhat hot and humid but it is generally recognised that it is a place where extreme discomfort is not felt. It would not as at Delhi be necessary to proceed to the hills to carry on the work. On general grounds the climate of Dehra Dun is probably as good as could anywhere be found in North India combined with equal accessibility and the presence of large and spacious sites.

If the scheme for a headquarters is to include provision for some six sections as we propose, in our opinion Dehra Dun offers the most appropriate and suitable location.

(3) *The buildings required.*—At this stage we can only give an outline of the scheme of building which we consider to be appropriate to the Institute, and offer some general considerations.

The first principle to be observed is that the architecture shall be subordinated strictly to serve the scientific purposes of the buildings. There are unfortunately numerous instances within our personal experience in which imposing and ornate buildings have been planned and erected at great expense to represent what their architects have thought suitable for the scientific objects in view. In these the proper performance and development of scientific work is sometimes permanently hampered by the structural conditions imposed upon it, while much quite unnecessary expense has been incurred. Happily there are other instances, especially in recent years, in which the architect by entering into real partnership with the scientific workers has contrived a building in which beauty has been admirably gained by the subordination of design to fitness.

The most stable part of the work to be accommodated will be that of Administration, Publications, Library and Museum, with the Epidemiological and Statistical Section and these might be in the more central and important part of the building. With them or in connected wings it may also be convenient to group the main laboratories of the basic sectional sciences. For the purposes of some of the Sections or Units simple detached buildings may be advisable and these should be so planned as to allow of easy modification or extension as the work follows its natural lines of growth in coming years.

All this needs close and prolonged attention, combined with special study of the best modern means of adapting the structural requirements of scientific work, which for temperate climates have now approached something like standardisation, to the climatic conditions of India. It will probably be found desirable to place a suitable officer on special duty to give full consideration to these problems of laboratory construction. In consultation with an architect plans could then be drafted for consideration by a committee of scientific workers We think it highly important that the chief men who are going to work in the proposed Institute should, so far as is possible, be brought into this consultation. For that reason alone, among other reasons already advanced, we think that the selection and organisation of the team of workers to be employed should begin with the least delay if our scheme as a whole meets with approval. It should precede and accompany the preparation of the Institute building and not follow it.

(4) *Site.*—The only sites available at Dehra Dun that seem to deserve consideration are :—

(*a*) A site in some part of the 130 acres of land taken up for the new Imperial Forest Research Institute which we have been informed would be available.

(*b*) Occupation of a part of the large new Imperial Forest Research Institute.

(*c*) Occupation of the present Forestry College, Chand Bagh and its grounds which we understand may be made available on the removal of the college to the large new Institute.

(*d*) A site on land bought originally for the Survey of India and now available.

Of these, (*a*) offers no advantages over (*c*) or (*d*) and is three or four miles further from the town. As to (*b*) though we think the medical and forestry organisations have many mutual advantages to gain as neighbours, it would be undesirable for many obvious reasons that they should share a single building, even if the structure could be adopted to serve a new object.

Only (*c*) and (*d*) remain for serious considerations. As to (*c*), we were informed that on the removal of the College to the new Imperial Forest Research Institute, no objection would be raised on behalf of the Forestry interests to the assignment of the whole site and its buildings to the purposes of medical research. The site has an area of about 50 acres. It is near the town and has the advantage of being already levelled and developed. It is planted with some fine trees, is walled in and has properly made approaches and internal drives. Regarded simply as an empty site it offers obvious advantages. It is ample in size for any development to be reasonably foreseen.

The plain disadvantage of this Chand Bagh site is that the Forestry College building upon it was not designed for medical research purposes and we would strongly urge that the work and reputation of the proposed Central Medical Research Institute are too important to be compromised by any policy of making a second hand building "do". The college building is dignified and in several respects under skilled treatment might be found to serve adequately as the central block of the new Institute. We were unable in the time at our disposal to give more than a superficial examination. A small chemical laboratory separate from the main building has some features likely to be directly useful in relation to future accessory work. Three bungalows stand in the grounds of which two may be found useful while the third is already condemned and should be cleared away, with or without use of its foundations for other purposes. There is a range of students' quarters which might be adapted to serve as quarters for some of the junior staff and temporarily attached workers.

As to the remaining site (*d*) this is undeveloped ground covering some 200 acres in all. It is broken up by deep nullahs, but the nearest unbroken area, which also has a road frontage, gives over 50 acres and this itself is large enough for all prospective needs. The advantage of (*d*) over (*c*) is that it offers a clean slate for the unfettered design of a new Institute.

The advantage of (*c*) over (*d*), if a completely free hand is given about the building, is that it is already levelled, drained, planted and walled in and its use would save a corresponding cost in money and time.

A decision between the alternative of (*c*) and (*d*) should not be made, we think, without critical investigation in detail by architectural and scientific experts together and this should include the officer on special duty whose appointment we have suggested.

C.—Estimated cost of the Department and Institute.

At this stage it is impossible to give anything like precise estimates of cost either for the Department or the Institute but we shall indicate on broad lines what we think these may be.

The amount to cover salaries of the superior staff has been calculated on the basis that pay required to obtain suitable men will rarely be below Rs. 1,500 per mensem and may be in the case of Directors of Sections as high as Rs. 2,500. We have taken as round figures for calculation the following :—

	Rs.
Director-in-Chief	3,000 per mensem.
Directors	2,500 ,,
Assistant Directors	1,600 ,,

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In estimating the working cost of the Institute we have had to consider that this is not, as we have explained, quite comparable to an institute staffed by workers engaged solely at some fixed laboratory, but is the headquarters of a body of men largely engaged in field-work elsewhere. Travelling and other expenses may therefore be relatively high.

On the basis of the working expenses of the existing Central Research Institute, of the Malaria Survey of India and of other available data we think that the subordinate staff and working expenses would not be less than Rs. 3,00,000 annually. Professor Starling allowed Rs. 1,50,000 for the Delhi and Kasauli Institutes and Rs. 1,50,000 for the scientific expenses of the clinical unit. The first of Professor Starling's estimates is we think too low, as the annual expenses even of the present Institute at Kasauli are over Rs. 1,00,000. The working expenses of the Malaria Survey of India, *i.e.*, of a large "section" are (annual budget 1927-28)

Rs. 57,400. Assuming that the administration charges for the Institute as a whole are Rs. 80,000 and that two large Sections (Bacteriology and Malaria) cost each Rs. 60,000 and that 5 smaller sections cost Rs. 20,000 each we shall arrive at the total figure of rupees 3 lakhs given above.

The cost of the Institute and of the organisation based upon it may therefore be estimated roughly as—

Salaries of—	Per mensem. Rs.	Annual. Rs.
1 Director-in-Chief at Rs. 3,000 .	3,000	
7 Directors at Rs. 2,500 . .	17,500	
19 Assistant Directors at Rs. 1,600 .	30,400	
	50,900	6,10,800
Cost of subordinate staff and general working expenses including (cost of field enquiries	..	3,00,000
Total .	..	9,10,800

This expenditure would, however, replace that on the present Central Research Institute and that on a certain number of men at present paid for by grant to the Indian Research Fund Association. At the Central Research Institute, Kasauli, are 4 men and we may estimate the men under the second head as about 8.

Expenditure additional to that now incurred would therefore only be :—

	Rs.	Rs.
Expenses of organisation and Institute as above	..	9,10,800
Deduct present cost of Central Institute at Kasauli (1927-28)	2,23,230	
Deduct present cost of 8 men employed on I. R. F. A at average salary of say Rs. 2,000	1,92,000	
Total deduct .	4,15,230	4,15,230
Total .	..	4,95,570

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It must be noted that the Central Institute, Kasauli, recovers from sale of vaccines an annual amount approaching the total expenditure on the Institute for all purposes.

Professor Starling allowed Rs. 4,95,800 for salaries of superior staff in his scheme for a Central Institute and Clinical Unit.

The cost of the buildings of the Institute may be taken as Rs. 12,00,000 non-recurring. An expenditure of Rs. 6,00,000 might be necessary in the first place and the remainder would be spent gradually over say 5 years time.

VI.—PROVINCIAL INSTITUTES.

We have already given it as our opinion that no useful purpose would be served by suggesting any form of direct control of the Provincial Institutes by any central agency. We have also said that Provincial Institutes should continue to work as at present on their own lines developing their own spheres of usefulness under their own Provincial Governments. We should not feel, however, that we had done justice to the interests of medical research in India as a whole if in our scheme we had not endeavoured to assist research under the Provincial as well as under the Central Governments.

Briefly our scheme provides the following direct and indirect assistance to Provincial Institutes or other medical research activities in addition to that which will continue to come to them from the Indian Research Fund Association :

(*a*) Six additional posts on the cadre of the Medical Research Department for increasing the superior staffs in Provincial Institutes.

(*b*) A clinical unit with a Director and two Assistant Directors based on the central organisation and paid for under this head but attached for periods up to 3 years to suitable medical institutions in the Provinces.

(*c*) Provision of a larger cadre on the Medical Research Department (increase of 20 posts) which will increase the facilities with which Provincial Institutes can obtain men for their superior staffs.

(*d*) Provision of increased pay for non-I. M. S. incumbents in the Medical Research Department which will increase the effective status of some of the men attached as superior staff to the Provincial Institutes.

(*e*) Formation of "Sections" in the central organisation devoted to special lines of work in medical research and the development by these sections of field work throughout India wherever this can best be done. This will increase the facilities with which the Provincial Governments can obtain men for special work "on call".

(*f*) Arrangements (Sections of the central organisation) by which technical assistance can be more readily obtained by workers in the Provinces; for instance, medical information, statistical work, and identifications.

(*g*) Closer association of work done on All-India lines with Provincial medical research and public health activities.

The provision of 6 additional cadre posts for Provincial Institutes is we believe a matter that can only be arranged through the Provincial Governments themselves. We can only advise this provision and point out that, in view of the very varied and important duties Provincial Institutes now perform not only in research but in direct assistance to public health and in other ways, they appear to us understaffed as regards superior personnel. The superior staff at the Pasteur Institute of India, the King Edward Memorial Institute at Shillong and the Pasteur Institute at Coonoor consist each at present of a Director only. Under these conditions these Institutes cannot really progress in the many lines of usefulness which they might well select. It is very wasteful to isolate workers in this way and we feel sure great benefit would come from giving an Assistant Director to these Institutes. Two at least formerly had such an Assistant Director on their staffs. This will take up three of the six additional posts. The remainder should, we think, be distributed between the Haffkine Institute, Bombay, and the King Institute of Preventive Medicine, Madras.

The actual Pasteur treatment work at Coonoor is we understand now small in amount, but the Institute is a distributing centre for rabies vaccine throughout the Madras Presidency and has suitable laboratory accommodation for important research work. Its potentialities can never be developed under a single Director without scientific companionship or assistance.

The Pasteur Institute of India should be a centre of research in rabies work of all kinds, but it is impossible that it can become this under a Director who does not get any relief from the daily routine of inoculation and some scientific stimulus from at least one other worker. Men who can do useful work under these conditions are very rare.

The King Edward Memorial Institute, Shillong, is in the midst of one of the richest fields for medical research in the world. Well equipped as it is, it is an anomaly that it should possess only one superior officer in charge. This condition should surely be remedied in justice to an important Provincial Government faced as is that of Assam by problems like those of kala-azar, malaria and hookworm disease and other problems of no less importance.

The Haffkine Institute is the oldest of the Indian Bacteriological Institutes with a splendid history of medical research achievement. It at one time appeared that this Institution like its sister Institution in Calcutta might have become a great centre of teaching and research in tropical medicine. The failure of that scheme is by almost universal admission greatly to be deplored.

The King Institute is a large Institute with many activities. At present it has a Director and an Assistant Director. We think this fine Institution should have at least one additional Assistant Director if not more.

As regards these centres of Provincial activity we feel indeed that the help we have suggested is still inadequate to their real requirements. An essential part of our scheme is that the central organisation we propose should have its counterpart in strongly supported work in the Provinces. Provision has been made for an increase of the Medical Research Department by six for the purpose of increasing the staffs of Provincial Institutes as an urgent and immediately necessary measure. If we are right in our belief that the acceptance of provision of increased staff to the Provincial Institutes lies with the Provinces themselves it is to be hoped that the Provincial Governments will themselves recognise the need for increased man power in these excellent institutions.

VII.—OUR PROPOSALS FOR THE ADMINISTRATION AND DIRECTION OF THE MEDICAL RESEARCH DEPARTMENT AND CENTRAL INSTITUTE AND THEIR RELATIONS TO OTHER RESEARCH ACTIVITIES.

In Chapter II we interpreted our terms of reference as including the organisation of medical research in India as a whole, and as implying a consideration of the precise form of machinery by which the duties and responsibilities of the Government of India in relation to medical research are to be fulfilled. We wish to say at once that this interpretation does not, in our opinion, require us to devise an entirely new plan for initiating, organising, directing and maintaining medical research activities in India. We think that our problem can be solved by building upon the foundation of past experience and by securing the continuity of the evolutionary process which has been going steadily, if somewhat tardily, since 1900.

The foundation to which we refer is the original Government scheme for the provision of an efficient staff of bacteriologists, based upon a Central Research Institute, which would provide Directors and Assistant Directors for provincial laboratories and trained research workers for investigating problems of disease anywhere in the country. We think it important, therefore, to understand the part which the existing central institute and organisation of workers have played in the past, and should continue to play in the future, in relation to medical research activities conducted in various parts of India.

In the first place it emerges clearly from our historical notes in Chapter III that the Government of India have always been responsible for providing properly staffed and equipped laboratories where existing knowledge is utilised to solve the practical everyday problems of preventive and curative medicines which everywhere confront the modern public health administrator. Important examples of this kind of necessary assistance are the preparation of sera and vaccines, the provision of anti-rabic treatment, and the scientific training of workers; other examples are bacteriological diagnosis and the investigation of the cause and mode of spread of particular outbreaks of disease. In India, as in England and other civilised countries, an adequate arrangement to meet these routine needs is, and always will be, a direct and obvious duty of the Central Government, whatever responsibilities and duties Local Governments may take upon themselves for the same purposes. In England the Central Government, represented until 1920 by the "Local Government Board", and since by the "Ministry of Health", has always maintained its own bacteriological, chemical and other scientific laboratories for routine investigations and for the research work to which the results of those investigations so often lead. This research work is of a high order but its essential character is that it is not pursued beyond what is judged to be the immediate need of the situation from the point of view of public health administration.

The Government of India scheme of laboratories and bacteriological staff already mentioned, was designed to play precisely that part; its specific purpose was defined as being " to utilise scientific investigation in aid of sanitary administration "

But, as we mentioned in Chapter II, medical research is understood to-day to include something much more than investigations obviously of immediate service to the public health and medical administration. In India, even before the Government scheme was initiated, it was known that when research workers were given freedom to follow up the results of utilitarian investigations along paths which seemed at first sight to lead to no utilitarian goal, discoveries were occasionally made which revolutionised the practical methods previously in use for dealing with disease. We have referred to this side of medical research more than once in the present report and have mentioned as an instance that a revolutionary change in the existing methods of dealing with cholera might possibly come about if research on the bacteriophage problem is vigorously continued along lines opened by the two British investigators Twort and d'Herelle and recently pursued by the latter under the Indian Research Fund Association in India.

In most countries it is curiously difficult to convince administrators that the provision of properly staffed and well equipped laboratories for routine investigations and the research work to which the first results of those investigations lead, must be supplemented by provision for the more basic medical research to which we have just referred. Fortunately in India this was not so. In this country the period during which every proposal for medical research had to pass through the narrow channel of administrative scrutiny and financial control lasted only a few years after the five chief laboratories (including the Central Institute) were opened. In 1911 the Government of India initiated an epoch of almost complete freedom for medical research from that system of administrative procedure and control. They founded and liberally endowed an association (the Indian Research Fund Association) with a Governing Body which was permitted to spend its annual income for medical research in whatever way it thought best, and was permitted, also, to use the Central Government's existing bacteriological staff and Central Research Institute to organise and conduct its activities.

We have shown in detail in other chapters of this report that the Association made full use of these privileges and that after an unavoidable period of abeyance during the War, it has been able during the last five years, largely as the result of its freedom from the usual machinery of Government administrative control, to augment very greatly the volume and scope of medical research activity in India.

On the other hand, we have shown that the Association overtaxed the already restricted resources of the permanent Government organisation for routine work and research, in the first place by designating to the Association's activities in the field nine of the 15 officers holding " unspecified " appointments on the permanent cadre of the Government's bacteriological department (now called Medical Research Department) and in the second place by employing on special researches in the field and as professors at a teaching institute some senior members of that cadre whose services were needed as Directors or Assistant Directors of the Central or Provincial laboratories.

It will be seen from the above account that what we have first to consider is the relation of the two organisations, namely, the Medical Research Department and the Indian Research Fund Association, each of which plays its distinctive part in the Government machinery of medical research.

The Medical Research Department, we think, is analogous to the organisation of bacteriologists and other scientific experts which, as has been mentioned, is utilised by the Ministry of Health in England. The primary purpose of the staff of the Department in India, as of the staff at the Ministry of Health in England, is to enable the Central Government to fulfil its obligations with regard to some routine needs and, in addition, to pursue research with a view particularly to gaining knowledge which can be put to immediate practical use in public health and medical administration. In India this purpose was clearly stated in the Government resolution of the 6th September 1904 which assigned the task of organising medical research to the Sanitary Commissioner with the Government of India in the following terms : " One of his duties will be the organisation and direction of research throughout India, which will steadily increase with the progress of the scheme for the establishment of fully equipped institutes for the study of health problems in India .... If the scheme is to be efficiently worked and to promise results which will justify the expenditure incurred, it must be under the control of a competent public health expert who can supervise, organise and co-ordinate the work, can prevent conflict and overlapping, and being himself in close touch with health affairs throughout India, can determine what questions call for scientific investigation, and where and by whom the work should be done."

That those who know most about the needs of India to-day are not at all desirous of dissociating themselves from that tradition and inheritance, is evident in the reports of the " Conference of Sanitary and Bacteriological Experts held at Delhi in December 1918 " and the " Conference of Medical Experts held at Simla in May 1919 ". The latter Conference was summoned to discuss primarily the best methods of utilising a grant of five lakhs which had been made by the Government of India as an initial grant to form the nucleus of a " Public Health Fund ". The Conference recommended : (1) that an Imperial Board of Health should be created;

(2) that a new Central Medical Research Institute should form an essential plank in the public health policy of the Government of India; (3) that the Director of this Institute should be a member of the Imperial Public Health Board; (4) the incumbent of the post " Director of Medical Research " should also be a member of the Board.

Professor Starling, in his report of 1920, which is now the chief subject of reference to our Committee, went even further towards the same end, for he recommended that the proposed " Imperial Public Health Board " should be the Governing Body of the new Central Medical Research Institute. He said in his report that the new Institute, representing as it would the chief organisation for clearing up problems of disease and for the discovery of new knowledge, "should be for this purpose the hands and brain of the Central Board of Health which it is proposed to establish in India".

The Director-General, Indian Medical Service, is the administrative head of the Medical Research Department and the Public Health Commissioner with the Government of India is his staff officer and acts as Director of Research for him with regard to the Department's activities.

The administration of the " Indian Research Fund " is in the hands of the Governing Body of the Association which consists of :

President,	The Hon'ble Member representing Health on the Council of the Viceroy and Governor General.
Members,	The Secretary to the Government of India in the Department of Education, Health and Lands.
	The Director-General, Indian Medical Service.
	The Public Health Commissioner with the Government of India.
	The Director, Central Research Institute.
	The Director, Central Malaria Bureau.
Secretary,	The Public Health Commissioner with the Government of India.

It is doubtless true that from the nature of the constitution of this Governing Body, the Association is essentially a Government-controlled organisation. But we have already emphasised the point that, as Government created the organisation for the specific purpose of giving freedom and facilities for the prosecution and promotion of medical research in whatever direction and by whatever methods the scientific advisers to the Association think best, it is obvious that the high administrative officers who are on the Governing Body will normally desire to assist, rather than to hamper, the putting into effect of the advice of their Scientific Advisory Board. In point of fact hitherto the advice of this Board has always been adopted. In India this principle has become a precedent and tradition for the activities of the Association and we are assured that it is, and will always be, safeguarded.

The advisory organ of the Governing Body is a "Scientific Advisory Board" which consists exclusively of scientific men of high standing in India (including the Directors of all the chief laboratories and non-I. M. S. as well as I. M. S. men) with the Director-General as Chairman and the Public Health Commissioner with the Government of India as Secretary.

There is still one more arrangement for bringing the needs of medical research to notice in India, namely the "All-India Conference of Medical Research Workers" which has been held annually since 1921. The Public Health Commissioner with the Government of India is the permanent secretary of this Conference. At the annual meeting, workers from all parts of India have an opportunity of impressing their views on members of the Government's permanent scientific staff (the Medical Research Department) as well as on officers and members of the Association.

As to the relations between the Medical Research Department and the Indian Research Fund Association we are of opinion that no radical change in the present arrangements is necessary or desirable. The two organisations should continue to work side by side in close association or affiliation, but they should not be amalgamated. The necessary collaboration and co-ordination between them is ensured so long as the existing arrangement is maintained by which the Public Health Commissioner is staff officer to the administrative head of the official Research Department and is also member and Secretary of the Governing Body of the Association. The Public Health Commissioner, by virtue of his several appointments mentioned, as well as because he is a touring officer, is intimately informed of the views of research workers and public health officers throughout the country. He also becomes acquainted with the views of European workers during his annual attendance at the meeting of the Committee of the *Office International d'Hygiene Publique* in Paris and at the meeting of the Health Committee of the League of Nations in Geneva. He can readily bring the knowledge thus acquired, and the bearing it has on the activities of medical research in India, to the notice of the Government of India either through the Director-General, Indian Medical Service, or through the President of the Governing Body of the Indian Research Fund Association. In practice all this machinery for initiating and directing medical research in India, and for ensuring that the needs of public health administration are kept well in view, works satisfactorily and smoothly.

As to the future of the two organisations respectively we also think that no radical change of a reconstructive kind is required. The cadre of the Government Medical Research Department should be increased on a liberal scale. This is urgent and of essential importance. The cadre and the laboratories, Central and Provincial, are the foundation, and they must be made permanently strong before any effective superstructure can be built. If, as we believe, it is correct to say that the primary purpose of providing laboratories and a permanent staff of highly skilled bacteriologists in India was, and still is, to aid medical and public health administration, then the proper staffing and equipment of existing laboratories and the provision of a sufficient number of additional members of the permanent staff to constitute an effective nucleus of each of the " Sections " or "Units " of the new Central Institute, is of prime importance and brooks no delay. When we recall that, as long as fourteen years ago, the Director of the Central Research Institute, Kasauli (Major W. F. Harvey, I.M.S.) in his statement submitted to the Royal Commission on the Public Services in India, advocated " an increase of at least 20 superior officers to the permanent cadre and an increase likewise in the number of assistants employed " we are surprised and almost ashamed at the moderation of our present demands for permanent staff.

The Indian Research Fund Association gives means for building an effective superstructure on the foundation of the Medical Research Department. It should be allowed to develop along its present lines but should be required to recruit its own workers to a much greater extent than hitherto. In Chapter VIII we have suggested that recruitment of workers under the Research Fund should aim, so far as is practicable, at making the Association a source of recruitment to the permanent cadre of the Medical Research Department. This practice would ensure that the cadre consists of men who have been well tried in the field in India.

Within the limits of our knowledge of a subject which is legal rather than medical or scientific, we have carefully considered whether we should recommend any change in the present constitutional or legal position of the Association in relation to Government. The chief object of changing the existing status would be to endeavour to do so in such a way as to obtain more donations and bequests. The Association is already permitted by Government to accept such gifts but it has been urged that contributions would be more likely to be forthcoming if the Association were permitted to become a legalised entity. We understand that it has already been under consideration whether the Association should be registered under the *Societies Registration Act of 1860.* The Association of course has no guarantee that its annual income will be permanent and we are aware that, as a result of the recommendations of the Indian Retrenchment Committee under Lord Inchcape, the annual grant was in fact stopped for a few years though it was restored as soon as the Government were able conveniently to do so.

We have great confidence that the Government of India will continue to pursue the liberal policy in the promotion of medical research which has marked their action up to the present. We think that the result of that policy has been that the Government of India is now in a fair way to possess an organisation for medical research of which any country, whether in the East or West, would be justly proud. Therefore we are content in knowing that if the Government considers that the position of the Association could be improved by changing its present status they will take the necessary steps to do so.

There is one direction in which an improvement can be made in the constitution of the Association without other change in existing arrangements. There should be closer liaison between medical research organisations of India and of England. The necessity of recruitment outside the Indian Medical Service has made the task of obtaining well qualified research workers more difficult. Several of the posts of Directors of Sections in the new Institute will almost certainly have to be filled in the first place by recruitment outside India, for India does not at present possess, whether in the Indian Medical Service or among her own graduates, men who are qualified for them. The closer liaison with research organisations in other countries which this difficulty of recruitment makes necessary, can best be arranged, we think, through the Governing Body of the Indian Research Fund Association, because the constitution of the Governing Body permits the addition of men of influence residing outside India to its membership. We think, therefore, that four consulting members resident in Great Britain appointed by the Secretary of State should be placed on the Governing Body. They should be selected for their personal qualifications as being most interested in the Association's work and able and willing to assist their colleagues in India on questions of recruitment and other matters which may be specifically referred to them. Their functions should be consultative, not advisory, and they would take no part in the executive activities of the Association. The four we suggest are :

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A representative of the India Office.
A representative of the Ministry of Health.
A representative of the Medical Research Council.
A representative of the Royal Society.

We think further with a view to coping with the now very large and increasing amount of work which is falling on the Secretary of the Association that the appointment of a paid Assistant Secretary to the Association has now become necessary if Medical Research administration is to receive proper attention.

This concludes our recommendations relative to the Medical Research Department and the Indian Research Fund Association, but we have not as yet referred specifically to the relations of the new Central Research Institute to those organisations and to the administrative departments of Government. The Institute, of course, will be, as at present, the central laboratory of the Government's official Medical Research Department and we have assumed in our report that it will continue to be the headquarters of workers under the Indian Research Fund Association. We have recommended that it should contain the editorial and other offices required in connection with the "Indian Journal of Medical Research" which is the Association's journal and is now edited, and will doubtless continue to be edited, by the Director-in-Chief of the Institute (who will be a member of the Government's Medical Research Department) in collaboration with the Public Health Commissioner with the Government of India who is secretary to the Governing Body of the Association. It seems to us that the extension of the scope of the Institute's normal activities in this way to meet the needs of the Association brings with it the need to arrange that the President of the Association should be brought into closer personal touch with the Institute than hitherto. We anticipate, also, that if Government approve our recommendations for an Institute worthy of India's position in the field of medical research it will be necessary that the Institute should have its own Governing Body composed perhaps in the first place of the following officers :—

President,	The Hon'ble the Member of the Council of the Viceroy and Governor General in the Department of Education, Health and Lands.
Members,	The Director General, Indian Medical Service.
	The Public Health Commissioner with the Government of India.
	The Director-in-Chief of the Institute.

Relations to other research activities.—The relations of the Research Department, the Association, and the Institute to one another and to Medical Research activities in Provincial Institutes and elsewhere in India have been discussed already.

Close co-operation with research work in other than the medical field of science can be arranged through the proposed Governing Body of the Institute and through the Governing Body of the Association. We think it highly desirable that definite arrangements should be made for co-operation, wherever possible, between workers in medical science and workers in agricultural and veterinary sciences. We refer to this again in Chapter IX.

If our recommendation for the addition of four consultative members resident in Great Britain to the Governing Body of the Indian Research Fund Association is sanctioned it will result in a desirable link with research work and public health activities in that country.

The co-operation of the various parts of the British Empire in scientific work of all kinds was made the subject of special study by the Imperial Conference of October 1926. It was referred to a Research Special Sub-Committee of which the Earl of Balfour was Chairman and upon which India was represented by the Maharaja of Burdwan and Mr. (now Sir) D. T. Chadwick. The Sub-Committee, whose report and recommendations were later adopted by the Conference as a whole, thought it "most desirable that all those organisations in the different parts of the Empire engaged in similar branches of research should freely and directly intercommunicate on all topics of common interest. Among matters of common interest are included not merely particular researches contemplated or in progress, but the gaps in present knowledge which appear most worthy of special attention". It was further explained that "in Great Britain large sums are found by the Government to assist primary scientific work and to organise inquiries upon a secondary plane within the broad fields respectively of agriculture and fisheries, in their exploitation of both animal and plant life, of medicine, including the preservation and right use of the human body in all conditions; and of the applications of science to industry. The organisation of these great departments of work is in no case a bureaucracy of lay officials, but is, to greater or less degree, under the control of appropriate scientific men of the country". Further, "in the experience of these three Departments an urgent need has been found for machinery for direct communication between any one of these Departments and the corresponding department or organisation in any other part of the Empire ", and instances were given, in the fields both of pure and applied science, in which this kind of communication had value. "It would be a great gain if the official representative of each organisation throughout the Empire responsible for one of the broad fields of work, *e.g.*, in agriculture, forestry, horticulture, medicine, mining or manufacturing industry, could have designated to him 'opposite numbers' in other parts of the Empire with whom he could communicate directly." It was shown in the report that the organisation of equivalent directing agencies in the different parts of the Empire and their linkage in direct communication would greatly facilitate the solution of many of the present problems of man power, of recruitment and of the interchange of workers in the several research services.

We think that by means of the arrangements which we have outlined and recommended in this chapter and others it should be an easy matter to ensure suitable linkage and co-operation in medical research between India, Great Britain and other parts of the Empire.

VIII.—RECRUITMENT AND TRAINING OF RESEARCH WORKERS AND ASSISTANTS.

We are asked "to investigate the strength and constitution of and method of recruitment to the Medical Research Department" and the training of assistants for medical research work.

Recruitment to the work of medical research in India must be considered, from first to last, in its relation to the Medical Research

Department, based as that will increasingly be upon the Central Research Institute we propose, and supplying still the Directors and Assistant Directors of the Provincial Institutes.

Let us briefly recall what we have said already about the Medical Research Department. We described the origin and growth of laboratories in India under the Bacteriological (now Medical Research) Department which was created to staff them. This has been, ever since, the agency used to build up the Institutes for routine bacteriological work, anti-rabic treatment and the preparation of sera and vaccines, as well as the rest of the organisation for medical research as it exists in India to-day. We gave our reasons for recommending that the Government of India should continue to provide a cadre for the purpose of staffing the Provincial Institutes as well as the Central Institute, and we expressed the hope that Provincial Governments should ask for more Assistant Directors whose qualifications, training and experience are such as to bring really effective help to the Directors. We pointed to the difficulties arising from the practice hitherto adopted by the Indian Research Fund Association of indenting almost invariably on the permanent cadre of the Research Department for officers qualified to undertake important research work and even for men needed to fill professorial Chairs. We showed that this practice has meant the employment elsewhere of men who would otherwise have been utilised as Directors or Assistant Directors of the Central or Provincial Institutes. We showed also that the permanent cadre has been for some time below its sanctioned strength owing to a failure to obtain the release of three selected officers from Military employ. These causes have combined to produce a grave shortage of men fit and available for research work of the kind needed.

While effective new recruitment is thus made urgent, other factors interfere with it. The cadre of the Medical Research Department has ceased to be homogeneous. On a single list there are two groups of officers; one group consists of officers whose pay on appointment to the permanent cadre is never less than Rs. 1,250 per month and rises after 20 years to about Rs. 2,050 per month; the other group is composed of officers whose pay on entry may be as low as Rs. 625 per month and rises after 20 years not higher than Rs. 1,350 per month. Besides this there is also the anomaly that, since seniority in the Department counts from date of entry into it, an officer of little experience belonging to the latter (lower-salaried) group may be senior to an officer of the former (higher-salaried) group who has better technical qualifications, greater experience and longer service in research work. This makes it impossible, without passing over some of the "senior" members, to give Directorships or Assistant Directorships in the Central and Provincial laboratories to the men on the cadre who have had the longest experience of research work in India and are otherwise best fitted for such posts.

Anomalies of this kind are disastrous to recruitment. If they continue it will inevitably happen either that the Research Department will die a lingering death from failure to obtain new entrants, or that its cadre will come to consist only of men who do not place a higher value upon their own capacities for research than is represented by a salary of Rs. 625 per month rising after 20 years to Rs. 1,350. We have ascertained by personal enquiry from young Indian medical men who are now engaged in research work that at those low rates of pay it will be impossible to recruit from among Indian medical men those capable of maintaining the standard of efficiency which has hitherto been the rule in the Medical Research Department.

This raises issues of vital importance. We think that at all costs India should maintain the high reputation which past achievements in medical research have won for her throughout the world. This cannot be done merely by some increase in the volume of research work; it can be done only by using men of the first quality and maintaining the high standards of technical work in the laboratory which are now required for any effective progress in knowledge.

How can this be done? Obviously the problem is more difficult now than it was 20 years ago when, from the Indian Medical Service alone, selection could be made among a body of about 750 medical men whose proficiency in medical science had been tested by competent authority and on the average was above that of any other medical service. There are still many advantages in recruiting from the Indian Medical Service. The men in this Service, before being employed in a laboratory, have passed some years in military employ in different parts of the country. They have had experience of discipline and if they have an aptitude for research they have usually had abundant leisure and opportunity to practise it. If any of the men selected are found not to fulfil their promise for laboratory work from any cause, there is no difficulty in finding other employment for them, and in that way a selection of the fittest becomes readily operative. We think that the present practice of reserving some appointments for officers of the Indian Medical Service is sound and should be continued. But it is not so easy to decide what proportion of the sanctioned cadre should be reserved for I. M. S. men. In the latest Government resolution, which dealt with only 30 appointments, 23 were reserved for I. M. S. officers and 7 were to be open to non-I. M. S. medical men. As the military authorities find it so difficult at present to relinquish I. M. S. officers from Military employ, it seems to us to be necessary to allow an increase in the proportion of non-I. M. S. and I. M. S. officers. We are of opinion that this should be done cautiously when considered necessary to fill existing vacancies. We think that every effort should be made to limit closely the period of military service for I. M. S. men.

When inability to fill one of the reserved posts from the ranks of the I. M. S. makes it necessary to recruit a non-I. M. S. man for the purpose, care should be taken to obtain a man with qualifications and experience at least equal to those of the I. M. S. officer to whose service the post might have been assigned. In our opinion the post would not be satisfactorily filled by appointing to it an officer of the group in the present permanent cadre at the grade of salary of Rs. 625 to Rs. 1,350 per month. If the appointment is to a Directorship or Assistant Directorship of a Provincial Institute, the standard required should be equal to that required in similar posts in first class laboratories in England. We can see no defence for including in the cadre some posts at a lower scale of pay than others. Second rate pay gets only second rate men. The Department is so small in comparison with the vast area and interests which it serves that it is indefensible to staff it with any but the very best men obtainable, and wasteful at the same time, for second rate men are useless. The Department if it is to do its work must be a *corps de'elite* composed of the best-equipped research workers Indian no less than English. We are assured that the present scale of pay for non-I. M. S. men does not attract the best equipped Indian medical men even when the expedient is adopted of giving them some years seniority on entry.

For these reasons then we think that the scale of pay for non-I. M. S. members of the Department must be revised radically and that it should not be lower and may have to be higher than the present scale for I. M. S. entrants.

In the recruitment of non-I. M. S. men to Government service in the Medical Research Department it will be necessary to safeguard the interests of Government by giving due attention to age, bodily health and suitability in other respects for Government employment. It is almost certain that these safeguards cannot be so strictly enforced as in the case of ordinary Government pensionable service and special rules applicable to the terms under which Government makes their appointments will have to be carefully framed. These rules must aim at providing adequate security of tenure and suitable pension arrangements by use of a Provident Fund or other means.

We are convinced that, as time goes on, a greater number of research workers whose qualifications are of the required high standard will be available among Indian graduates, but we do not agree with the view that their emoluments can be lower than those of entrants from outside India. In order to secure Indian workers of the standard required it is essential that the emoluments should compare not unfavourably with the income that can be made in consulting private practice by Indian graduates who have obtained the higher English medical qualifications and have, also, in some instances, spent several years of study in other European countries or in the United States.

We recommend the following general rules :

(1) All the additional posts which we have recommended for the cadre of the Medical Research Department should be open equally to I. M. S. and non-I. M. S. men.

(2) Recruitment to the present lower-salaried group in the Department should be closed at once.

(3) It should be definitely laid down and agreed to by all members of the Department that the Department is one from which the rule "seniority by date of entry" is specifically excluded.

(4) In accordance with our scheme for the organisation of the central research in "Sections" and "Special Units" recruitment should be governed by the principle of selecting men whose capacities fit them for definite posts in one or other of the established Sections. When the Director of a Section has been appointed, endeavour should be made to recruit for the post of Assistant Director a worker who has specialised in the same line, and the same principle should be followed for the recruitment of junior research workers in that Section. In this way each section will become self-contained and the junior men in it will gradually work their way up to become Assistant Directors and Directors. We regard the first appointments to the Directorship of Sections as being of essential importance to the ultimate success of the scheme. Of course this also applies, though in less degree, to appointments to other Sectional posts as well as to primary recruitment to the Department, but if, in the beginning, men appointed to Directorships are masters in their special subjects, they will instill into the Section a spirit of service to India in respect of the problems with which they deal, and will take proper steps to develop and foster the talents of junior men by training and encouragement.

We have given some thought to plans for assisting recruitment to the Department. We suggest that the Indian Research Fund Association, since it relies for its purposes so much on the Medical Research Department cadre, should take up seriously the question of recruitment to the Department from the open market.

The plan for recruitment should be worked out in collaboration with the Medical Research Department and assisted by the administrative Departments concerned. We think that it might be well in the first place to constitute a "Recruitment and Appointments Board" containing—

The Director-General, I. M. S.
The Deputy Director-General, I. M. S.
The Public Health Commissioner with the Goverment of India.
The Director-in-Chief, Central Research Institute.
One English non-I. M. S. member of the Medical Research Department.

One Indian non-I. M. S. member of the Medical Research Department.

One Indian I. M. S. member of the Medical Research Department.

The Assistant Secretary, Indian Research Fund Association (Secretary).

We do not think it is part of our task to recommend how a Board of this kind might proceed to obtain men of scientific attainments with the right aptitude and diligence for research. We would offer, however, the following suggestions in addition to the remarks upon the training of workers we make separately below :

(*a*) We would strongly urge that efforts should be made under the Research Fund Association to facilitate the " interchange " of workers engaged in laboratory or field work in India with similar workers in England or elsewhere. Men sent home temporarily from India in this way, if carefully chosen, might not only gain much benefit to themselves but do much to attract other workers to take advantage of the great opportunities for research that India has to offer; (*b*) the Association, by means of temporary research grants might widen their field of recruitment to include in its survey all young Indian graduates of promise. They will no doubt gain the assistance in this of all the Principals and Deans of the Medical Colleges of India. The Association can also, we are assured, count upon the assistance of the Medical Research Council of Great Britain and the equivalent organisations elsewhere in the Empire in finding young men who may be available to meet special requirements of research work in India. The arrangements for liaison with representatives in England which we have recommended in Chapter VII will also be useful for this object.

We would mention, also, that on the question of appointment the Board's services could be useful in two ways. When an appointment on the permanent cadre falls vacant which is open equally to I. M. S. and non-I. M. S. men the Board would meet to discuss the claims of candidates and to make a recommendation. If the Board recommend the appointment of a non-I. M. S. candidate we hope that the Public Service Commission will normally accept this method of selection by technical experts for research work and give it formal endorsement in each case when the relevant information has been supplied. We understand that this is the usual practice of the Civil Service Commission in England when analogous technical appointments are made. Secondly, when the headship of a Provincial Institute falls vacant, the Board will meet and come to a decision as to the respective suitability of the members of the central organisation who may elect to join a Provincial Institute rather than remain in their Section at the Central Institute. We have already urged that the pay and status of Directors and Assistant Directors of Sections of the Central Institute should be the same as the pay of Directors and Assistant

Directors of Provincial Institutes. The factor of increased emoluments should not have to be considered in making appointments to those institutes.

The training of research workers and assistants.—The training of a research worker is, of course, a lifelong process and the most senior workers are still learning. The young worker can only be trained in research work by actually doing it under sympathetic guidance. It is not, we think, for us to deal with the courses of instruction and higher teaching that must precede research work in a given subject. It is not, as we suppose, a function of the Central Government to provide courses of teaching lower or higher, and for that reason we are not disposed to recommend a system of 'research scholarships' under the name and form in which Professor Starling proposed their establishment in his scheme. We think, however, that our own proposals include, if under a different formula, exactly what he had in mind. We hope that the Research Fund Association will secure the training of young research workers in two ways. Young graduates (or others) who have shown keenness and competence in research will be eligible for research grants for approved work, in an approved place, under suitable direction. Such a grant when given is equivalent to a research scholarship. In addition to this, secondly, a Professor or Director may apply to the Assiciation for a young assistant, of his own choice, to help him directly in his own investigations. This if granted allows the best kind of training to a young graduate, besides aiding the work in which he is to assist, and, under a different formula again, is equivalent to a research scholarship.

A somewhat similar principle should be adopted for training Assistant Surgeons and Sub-Assistant Surgeons. One or two selected men should be attached as supernumerary staff to each Section and should take part in the work of the Section, gradually learning the technique of a particular subject and being transferred to another kind of work when proficiency has been attained.

Laboratory attendants who are to be trained should be attached to Sections in the same way. If each Section undertakes to have two or more extra attendants a goodly number of trained attendants would soon become available.

Consideration should be given to the fact that there now exist on the staff of the Central Institute, especially for the manufacture of vaccines, laboratory attendants of long service and exceptional attainment in their own line of work whose pay though at present non-pensionable is far below that of men temporarily employed under the Indian Research Fund Association. These men by retaining their permanent posts are at present gaining little or no advantage in any respect over men in the open market, while at the same time they are at serious disadvantage in respect of pay, their salaries being sometimes far less than that of temporary men who in standing and attainment are their inferiors. Care should be taken to prevent anomalies of this kind which at present seriously affect the working of the Pasteur Institute of India as well as that of the Central Institute at Kasauli.

IX.—NUTRITIONAL RESEARCH IN INDIA.

We have been specifically directed to investigate "the future of research on the problem of human and animal nutrition" presumably with special reference to India.

In giving our interpretation of our terms of reference we briefly indicated our view of the great importance of nutritional research to the welfare of India, and said there was hardly any other country in the world that had more to gain from it.

In nutritional science there are two main groups of phenomena to be studied. One is that of the quantitative relations of diet to health; this offers the problems of energy supply to the body and of the values of different foodstuffs considered as fuels, as substances used up in the chemical interchanges of the living organs. The second group supplies qualitative problems,—problems of the relation to health of variations of particular constituents of the diet in amounts too small to have any significant part in the energy supply.

Quantitative problems of food have been studied for generations and by increasingly accurate methods. Some of the basic knowledge needed for practical life has been gained already, though this is still imperfect at many points. The chief data obtained in this work and used as a basis for this part of physiology and medicine, have been obtained in temperate climates and for Northern races. Probably the results are applicable in large part to the people of India, suitable correction being made in the problems of energy involved for conditions of temperature and work. But this is largely an assumption, and one that depends upon another assumption, namely, that other physiological data like those of body temperature and blood pressure for instance are on comparable level in the races of North Europe and America and in those of India, respectively. This ought not to remain an assumption, and here is an obvious field of inquiry in which significant results could be got relatively easily and quickly. There are other sets of problems belonging to this quantitative side of dietetics which ought also to be solved, namely, those relating to diet to the special energy requirements of different forms of agricultural or industrial labour.

Qualitative studies of diet, on the other hand, in which the result of changes in the exact make-up of its constituents are followed are much more recent. It is now well known that giving or withholding certain complex substances ("vitamins") of organic origin, in amount so small as to be quite insignificant for energy supply, may not only affect the health but rapidly make the difference between health and gross disease or between life and death.

Similarly profound changes may be caused by giving or omitting minute traces of particular salts or elements. Experimental studies of this aspect of nutrition began less than twenty years ago, but they have brought about almost a revolution in our ways of thinking and are having a yearly growing importance for both preventive and curative medicine. Several diseases formerly thought to be due to specific poisons or infections, like beri-beri and rickets, were found to be due to particular minute deficiencies of diet, and to be easily prevented or cured by their replacement. Other definite conditions of disease are now suspected on good grounds of being "deficiency diseases" while it is become increasingly certain that minute deficiencies in given constituents of diet, whether in organic vitamins or in certain inorganic elements like iodine or manganese, may so impair the health of the body as to lower its resistance to disease in general. Investigation is not only adding to the list of "deficiency diseases" but is pointing also to the need for re-examining many current views of pathology and epidemiology in the light of this new dietetic knowledge.

Clear evidence has already been found in Europe and America of deficiency diseases or of more general signs of faulty nutrition among well-to-do people whose diet judged quantitatively alone is amply sufficient. Obviously the dangers of mal-nutrition in the sense of qualitative deficiency will increase for those whose diet is nearer the minimum for subsistence. The whole subject is recognised in all countries now as having great importance, therefore, both for rich and poor. For no country does it seem likely that this growing science of nutrition will have more practical importance than for India. India contains immense populations who whether from their economic position, the accidents of weather, or from social, racial or religious custom are either temporarily or permanently living upon diets so near the lower limits for subsistence or so restricted in their range that 'deficiency' in any given qualitative direction may very readily occur.

Investigation of this will be along two main lines, one, primarily observational, to discover by suitable surveys what is the present nutritional condition of the Indian peoples in the light of the new knowledge; the second, primarily experimental to add to the basic knowledge of the subjects by new studies, especially of deficiency diseases and allied conditions belonging to India. Surveys of dietaries from the new point of view cannot be made by direct observation and record alone. As most people now know the factors in food described as "vitamins" are still only revealed to us by the effects of their presence or absence; they cannot yet be directly detected or measured by simpler means than practical feeding trials made with animals. In that way the two sides of study just named will be closely linked.

The problem of 'animal' nutrition as well as that of 'human' nutrition is referred to us. This allows us to point to the intimate community of interest between workers in nutritional science whether they come from the agricultural or the medical side. This is true too for both the main divisions of agriculture, stock raising and crop production. Obviously the health of all stock animals will be related directly to their diet, while in so far as they supply human food, as in milk for instance, deficiencies in their fodder will be reflected, as we know for certain, in the health values of the food as consumed by humans, young or old. So, too, the detailed method of soil manuring, crop growing, and crop-handling in vegetable food production may have, as we now know, a vital influence upon the final food value for human use.

We have said enough, however briefly, to show the importance to the Indian peoples of this kind of study. It will be thought all the more surprising that on the medical side the only equipped unit for nutritional work of any kind is that now under the charge of Lieutenant-Colonel McCarrison which is maintained as a "deficiency diseases inquiry" by the Indian Research Fund Association at a total cost of about Rs. 70,000 and attached to the Pasteur Institute, Coonoor. There is only this single worker here with only subordinate attendants; an assistant in biochemistry which the Association have already arranged to provide had not begun his work up to the date of this report. We are not aware of any other systematic studies of nutrition in any of the other medical Institutes or laboratories of India. This puts in strong contrast the active and increasing support being given to nutritional studies in other countries. In England and in America there are many well equipped centres of active work, yearly growing in number and variety; in Japan a great Imperial Institute of Nutrition has been built, equipped and staffed which is solely devoted to this subject.

In our opinion it is of high importance to India that work of this kind should be greatly increased and extended here. It ought not to be limited to one place only. Attention ought to be paid to it at every important centre of medical research and higher teaching. It ought by no means to be concentrated as at present under one man alone, whose disappearance would, at this moment, break all continuity in the only work now being done. Nevertheless it is plainly impossible for us in our allotted time, if it were desired, to attempt here even a sketch of a future programme of work for India in this subject. The design of a new policy, in outline and detail must be worked out. We can only offer here our strong recommendation that this should be given a high priority of consideration. We ought here however to indicate the part in the scheme we now offer for a new Central Institute which we think should be taken by nutritional studies.

We contemplate, of course, as we have shown already that a Unit of research in nutrition shall be constituted as soon as possible at the Institute and in close relation to the section of biochemistry. This indeed was one among the developments we had in view when we realised the importance of so locating the Institute as to secure ample grounds for the relatively simple but extensive additional accommodation needed for this kind of work and for the production of special foodstuffs needed. We think that a subject so essential to the physiological and pathological basis of medicine could not properly be omitted here. It seems moreover specially appropriate that particular applications of this science to problems of India as such, as in surveys of national dietaries and their correlation with other characters of the people and other conditions of their environment, should be organised at this centre.

The details of future schemes must depend upon the qualities of men actually available; the development of this subject will need perhaps more than that of any other, some special actions in recruitment. Since the present work at Coonoor is the only organised work of the kind in India, we strongly recommend that it should be left *in situ*, with every added assistance that may be practicable, until it is clear that changes, if any, or removal, if desirable, can be effected without any serious breach of continuity. For various reasons into which we need not enter, its continuity has been broken more than once in the past with heavy resulting loss of time and opportunity. Further disturbance to it now would interfere not only with the solitary Indian organisation of the kind but also with the chances it offers of assisting a new policy of recruitment and training of workers for future extension elsewhere.

We should perhaps explain at this point some special features of this kind of work that call for practical attention. The work chiefly depends upon experimental feeding trials made with small animals. In other sciences a single experiment to test the value of a given idea may take only a few hours or even a few minutes. In nutritional work each single experiment normally takes several days and perhaps weeks. During the whole time scrupulous pains and unremitting attention have to be given to maintain every condition normal except the one under variation and all other conditions as constant throughout the experiment as possible. This is only attainable with adequate accommodation and the most careful training and discipline of the subordinate staff down to the most menial part of it. Failure at any point means beginning again. In hardly any other kind of study is continuity of work more important than in this.

Actual experience has shown that the relatively narrow range of temperature variation at Coonoor assists the regularity of experiments which may extend in time from one part of the year to another. This and other climatic reasons make the location suitable. Lieutenant-Colonel McCarrison has rooms by temporary arrangement within the Pasteur Institute Building. The animal experiments are done in inexpensive but well planned huts in the grounds. There are some simple factory buildings immediately adjacent, now empty and disused, which with their ground site belong, we were informed, to the Madras Government. If these could be added to the present accommodation an effective nutritional investigation unit would be immediately attainable, independent of the Pasteur

Institute building, which itself is vested in a private association in pursuit of its own proper aims. The addition we suggest would meet, we think, all prospective needs at least for a few years, during which full consideration could be given to the best mode of developing nutritional work for India as a whole. It should be added here that the Maharaja of Parlakimedi after seeing the present work at Coonoor has given a lakh of rupees to promote it by means of research studentships. This sum is now held in trust for that object by the Research Fund Association.

Another reason can be advanced for the retention of this nutritional work at Coonoor as at present organised. Already Lieutenant-Colonel McCarrison in his work is in touch with the agricultural research station at Coimbatore which is only 40 miles away. We have pointed to the great and mutual value of close association between medical and agricultural interests in studies of human and animal physiology or pathology. It would be found highly advantageous we think, if the nutritional work at Coimbatore developed and extended, could be linked even more closely with that at Coonoor.

In other parts of this Report we have discussed the relationship of work in India to cognate work elsewhere and particularly to that in Great Britain. The British Medical Research Council spend a large part of their available funds in the promotion of nutritional investigations and these are organised under a Nutrition Committee of the chief workers in the subject. It would help both sides we think if the development of this kind of work in India be forwarded under conditions of close intercourse with this Committee. Useful assistance might be found from the British Committee in solving questions of organisation or recruitment. On the other hand valuable opportunities might be offered in India for the confirmation or extension of observations made in Europe, while the special conditions of India to which we have referred, including the immense variety of dietetic conditions among peoples of different kinds, might present possibilities of solving particular nutritional problems and of supplying new clues for fresh experimental investigation.

X.—THE CENTRAL RESEARCH INSTITUTE, KASAULI.

If our proposals are adopted some action will be necessary in regard to the buildings of the existing Central Research Institute at Kasauli. In Professor Starling's scheme this Institute was to continue at Kasauli as a branch institute for manufacture of vaccine. We have elsewhere given it as our opinion that manufacture should be continued in connection with the Section of Bacteriology at the new Central Research Institute. We are not, therefore, in favour of permanently retaining the Institute at Kasauli either as a separate Institute or as a branch of the main Institute for the purposes of manufacture.

It will be necessary, however, to retain this laboratory until th new buildings are sufficiently advanced to make a move possibl The old buildings may continue to be very useful for some time t come in the formation of Sections.

In the event of our proposals being accepted as the policy c Government we suggest that the question of final disposition of th Kasauli Institute be left over until such time as construction of th new Institute is well advanced. If no suitable plan for using thes buildings has then been reached these should be sold.

If our proposals for any reason cannot, however, be accepted a once, then we think that Government, independently of what i may do at some future date, must take action of an emergency kin in respect to the Institute at Kasauli. The Institute is a converte bungalow which when it was opened in 1906 was recognised a unworthy of its status as an All-India Institute. Professor Starling in 1920 reported that even when an entirely new and much enlarge Institute was provided at Delhi the building at Kasauli would be insufficient for the needs and he recommended that it should be rebuilt on the same site so as to double the present accommodation. The incongruous character of the Government of India Institute, an Imperial research institute that consists of a one storeyed bungalow roofed with corrugated iron, struck us forcibly indeed, both in the pitiable relation it bears to the provision made for similar work in even poor and backward countries elsewhere, and in comparison with the new Institutes already built or being planned in Provincial cities of India.

As regards staff the same inadequacy is evident. We need only say that the sanctioned superior staff for the Central Research Institute is still today what it was when the Institute was first hesitatingly planned more than twenty years ago, in spite of the great growth of the medical sciences and of their practical applications.

There now exist at Kasauli two blocks of buildings, an old ground floor building in which the bacteriology and manufacture work is done, and a single storey block recently enlarged by an extension in which the Malaria Section is accommodated. This extension has been made at a cost of Rs. 14,000 and gives 3 good rooms constructed in ferro-concrete with a flat roof on which a second storey in the same style can at any time be built. The old portion of the Malaria Block as well as the old main building (Bacteriology) could be suitably re-erected in this style at moderate cost. In this way the old Institute could be rehabilitated with at least double its present effective accommodation at cost of say two lakhs.

Adjoining the Institute site on the same ridge but nearer Kasauli is the Widdicombe Estate. If this could be acquired an entire new block of laboratories could be erected to give accommodation for work in pure bacteriology, viruses, protozoology, helminthology and biochemistry. The Institute as a whole would then consist of 3 blocks—(1) a research block, (2) headquarters of the Malaria

Survey, (3) manufacturing block. Several unsuccessful attempts have been made to acquire the Widdicombe Estate, which is Patiala State property. Should it not be possible to acquire this property there are two adjoining properties in the direction of the parade ground which could be purchased and laboratory buildings erected.

For an All-India Medical Research organisation of the kind we have proposed Kasauli would not be suitable, but for a smaller scheme Kasauli would serve.

In this case, however, rebuilding would have to be considered.

XI.—SUMMARY OF CHIEF RECOMMENDATIONS.

I.—Institutes and Laboratories.

A.—The proposed Central Research Institute.

We recommend :

(1) that an Imperial Medical Research Institute which will be the Headquarters of a Central medical research organisation working throughout India, should be founded at Dehra Dun ;

(2) that the Institute should have its own Governing Body and its own Director-in-Chief ;

(3) that the functions of the Institute should be in general to serve as (*a*) a centre to collect and bring into proper relations with one another the results of medical research work throughout India, (*b*) the headquarters of a central medical research organisation (the Medical Research Department and the Indian Research Fund Association) working in the field anywhere in India and concerned chiefly with "all-India problems", (*c*) a centre for basic research work and a source of assistance to all in matters in which highly expert opinion is desired, (*d*) a bureau of information and publications, a place for keeping standard collections and type cultures and specimens, a central medical library and a central supply depot of equipment for workers in the field, (*e*) a training centre for medical research workers and assistants ;

(4) that the structure of the Institute be in accordance with the principle of organisation by "Sections" and "Special Units" as follows :—

Sections—
- I. Epidemiology and Statistics.
- II. Bacteriology and Immunology (including manufacture of sera and vaccines).
- III. Biochemistry and Pharmacology.
- IV. Medical Biology.
- V. Malaria Survey of India.

Special Units—
- VI. Clinical Research.
- VII. Nutrition.

B.—The existing Central Research Institute.

We recommend :

(1) that if our scheme for a reconstructed central medical research organisation basd on a central Medical Research Institute at Dehra Dun be accepted by the Government of India as their policy for all-India medical research, the existing Central Institute at Kasauli should be abandoned;

(2) that if our proposals as a whole are unacceptable in principle or along their major lines, the proposal for a new Institute at Dehra Dun should be rejected at once and action should be taken to proceed immediately with the parts of the scheme that are acceptable, using the existing Institute at Kasauli as the base. In this event the Institute should be reconstructed at a cost of say two lakhs and an endeavour should be made to acquire the Widdicombe estate. If for financial reasons it is found necessary to adopt for the present this modified scheme the decision should not be permitted to rule out the adoption of the complete scheme at a future date.

C.—The Provincial Institutes.

We recommend :

(1) that with a view to giving more opportunity for research work Provincial Government should be moved to take steps to increase the numbers of the superior staffs employed as Directors and Assistant Directors and to require for these appointments a high standard of qualification for research work;

(2) that with the approval of Provincial Governments 6 officers from the Medical Research Cadre should be made available to increase the sanctioned staffs of the Provincial Institutes.

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II.—THE MEDICAL RESEARCH DEPARTMENT.

We recommend :

(1) that the strength of the Department be increased from 32 to 52;

(2) that the following appointments be named as specified appointments—

(*a*) *Under the Government of India with headquarters at the Central Institute.*

Director-in-Chief of the Institute	1
Directors of "Sections"	7
Assistant Directors of "Sections"	19

(*b*) *Seconded to Provincial Institutes.*

Directors	5
Assistant Directors	12

(3) that there be 8 unspecified appointments:

(4) that the 20 additional appointments in the Department should be open equally to I. M. S. and non-I. M. S. candidates;

(5) that the composition of the cadre should be changed by closing recruitment to the present lower salaried group of non-I. M. S. members and by revising the rules, conditions and pay of non-I. M. S. appointments with a view to raising the standard required of members in that group. The scale of pay for non-I. M. S. members should be at least equivalent to, and may have to be higher than, the present scale of pay of I. M. S. members;

(6) that a "Recruitment and Appointments Board" be constituted with the duty of revising the rules relating to the appointment of non-I. M. S. members to the permanent cadre and of advising and taking approved action on all other matters so as to ensure that the Medical Research Department may consist of research workers who are of the highest standard obtainable from the I. M. S. and from the open market;

(7) that the specified appointments of "Sectional Directors" and "Assistant Directors" based on the Central Research Institute should carry the same pay and status as analogous posts in Provincial Institutes.

III.—The Indian Research Fund Association.

We recommend:

(1) the addition of four consultative members, resident in Great Britain, to the Governing Body of the Association;

(2) the appointment of an officer as Assistant Secretary to the Secretary of the Association;

(3) that the Association should recruit its own workers to a greater extent than hitherto, with the object particularly of making the Association the chief source of recruitment of non-I. M. S. men to the Government permanent Medical Research Department;

(4) that the legal status of the Association be taken into consideration.

IV.—Relations to other research activities.

We recommend:

(1) that no change be made in the existing relations of the Medical Research Department, the Indian Research Fund Association and the Central Research Institute to one another and to medical research activities in Provincial Institutes and elsewhere in India. The Medical Research Department and the Indian Research Fund Association should continue to work side by side in close collaboration but they should remain separate organisations;

(2) that there should be closer co-operation with research work in other than medical fields of science. A definite arrangement

should be made through the govern
search Institute and of the Resear
co-operation with research workers
sciences;

(3) that there should be closer lia
cal research organisation in India
Great Britain and other parts of the
that the Governing Body of the Central Institute and the Governing Body of the Indian Research Fund Association should arrange a system of direct communication on technical subjects between a representative of their respective organisations and an "opposite number" designated to him in England and other parts of the Empire.

V.—Method of recruitment to the Medical Research Department.

We recommend:

(1) that recruitment to the Medical Research be

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principle of

capacit nt them for definite posts in one or other of the "Sections" or "Units" in which the central research staff and Institute are organised; a consequence of this recommendation will be that recruitment will not necessarily be limited to men possessing a qualification in medicine;

(4) that a plan for recruitment should be devised by a working committee called the "Recruitment and Appointment Board" of representatives from the Indian Medical Service, the Medical Research Department, the Indian Research Fund Association and the Central Research Institute. We make three suggestions for the consideration of this Board; the first relates to the "interchange" of workers between India and England, the second to a system of temporary research grants, the third to the utilisation of the services of consultative members of the Governing Body of the Research Fund Association resident in Great Britain;

(5) that the selection of men from the open market by this Board should be accepted by the Public Service Commission in lieu of present arrangements, except in so far as formal endorsement of each appointment may be necessary when the relevant information has been supplied.

VI.—Training of research workers and assistants.

We recommend:

(1) that the Indian Research Fund Association should take steps to arrange for the training of young graduates in medicine or

other sciences who have been selected as likely to be good research workers. We have suggested two ways in which assistance by "research grants" might be given;

(2) that the officers of the Unit of Clinical Research who are attached to the Medical College Hospitals in the Provinces should employ as their assistants young graduates who desire to take up medical research work as a career;

(3) that Assistant Surgeons and Sub-Assistant Surgeons who are to be trained as assistants in medical research work should be attached as supernumerary staff to take part in the work of one of the "Sections" of the Central Institute;

(4) that the training of laboratory attendants should be arranged in the same way;

(5) that existing anomalies in the scale of pay of laboratory attendants of the Medical Research Department should be remedied.

(Signed) WALTER M. FLETCHER.

S. P. JAMES.

Delhi, March 5th, 19[illegible].

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